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Mandarin Orange

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Review Article

A Review on Polyembryony of Mandarin Orange

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1. INTRODUCTION

In India *Citrus reticulata* plants were very important fruit plants. The medical awareness campaign and widespread use of ethno botanical knowledge has revealed the importance of citrus fruits to the common people of India. The presence of ascorbic acid, essential oils and antioxidant has lead to the increased consumption and commercial utilization of this fruit. *Citrus* polyembryony can be used to propagate plants through nucellar embryos. *Citrus reticulata* shows high degree of polyembryony. Nucellar apomixes forms multiple nucellar embryos along with a fully developed zygotic embryo. The percentage of nucellar embryos varies from species to species. The nucellar embryos were somatic in origin and forms true to the type progeny. Nucellar embryos could be utilized for preservation of the desirable heterozygous state of mother plant i.e. fixing heterosis. Citrus germplasms can be introduced as budwood or seed. Budwood ensures trueness to type but increases the risk of exotic diseases and pathogen infestation. The risk of introducing diseases is less with seeds, because no citrus disease has been definitely proven to be seed transmissible. Citrus shows long juvenility and exploitation of morphological marker for hybrid identification is difficult. Enzymatic darkening, gas chromatography, isozyme analysis had been used to study the difference of zygotic and nucellar ones. The product of gene expression may reflect some environmental influence and produce erratic results.

Among the recently used molecular markers Random Amplified Polymorphic DNA marker is simple, cost effective and reliable. RAPD marker is used for a long time by researchers all over the world for its simplicity. SSR markers are co-dominant and more reliable but are not so useful for intraspecific studies and also expensive for regular use by small growers and farmers of North Eastern Hilly region. RAPDs have been extensively used in assessing relationship amongst various Citrus accessions (Das *et al.,* 2003), genotype identification (Deng *et al.* 2005), estimation of relationship. Moreover, in citrus several traits of horticultural

Table 1. Area, production and productivity of Mandarin Orange fruits grown in the world

Country	Area(ha)	Production (mt)	Productivity (mt/ha)
Brazil	729583	18012560	24.7
United States of America	250582	8166480	32.6
China	475000	6500000	13.7
Mexico	323357	3666790	11.3
Spain	154000	2933800	19.1
India	311176	2906308	9.3
Egypt	118731	2786397	23.5
Italy	83514	1770503	21.2
Turkey	45733	1662000	36.3
South Africa	45000	1612828	35.8
Others	1106193	16112401	14.6
World + (Total)	3642869	66130067	18.2

importance, including resistance to citrus tristeza virus (Ling *et al.* 1994), nematode resistance (Ling *et al.* 1996) and dwarfing (Cheng and Roose, 1995) have been tagged with RAPD markers.

2. AREA AND PRODUCTION TRENDS

The estimated current production of mandarin in India is 2906308 mt per year, covering 311176 ha land(National Horticulture Board, 2012-13).Ten major mandarin producing countries of the world are Brazil, United States of America, China ,Mexico, Spain, India , Egypt, Italy, Turkey and South Africa.

3. GENETIC DIVERSITY IN MANDARIN

Mandarin was considered as one of the

Table 2. State wise area, production and productivity of citrus (2012-2013) in India

Sr. No.	State / Union Territory	Area ('000 ha)	Production ('000 t)	Productivity (t/ha)
1.	Punjab	45.85	988.83	21.8
2.	Madhya Pradesh	49.52	844.00	17.0
3.	Maharashtra	133.00	370.00	2.8
4.	Rajasthan	10.50	227.38	21.7
5.	Assam	15.85	195.82	12.4
6.	Karnataka	3.20	71.80	22.4
7.	Nagaland	5.50	50.00	9.1
8.	Meghalaya	8.42	39.82	4.7
9.	Manipur	5.02	32.84	8.5
10.	Tripura	5.28	28.41	5.4
11.	Others	29.04	58.01	2.0
	TOTAL	311.2	2906.3	9.3

Source: National Horticulture Board, Horticulture Information Service, 2012-2013.

true citrus species (Barrett & Rhodes, 1976) and this idea supported by following researches (Nicolosi *et al.,* 2000; Barkley *et al.,* 2006). Mandarin group has great amount of cultivars and some of them originated from hybridization and the others derived from mutation. So, in the mandarins obtained from hybrid origin there was clear genetic variation. On the other hand, low level of diversity observed in the cultivars occurred by mutation such as Satsuma and Clementine groups (Breto *et al.,* 2001; Barkley *et al.,* 2006). In the recent study carried out with SRAP markers, mandarins separated two large groups at similarity level of 0.79 (Uzun, 2009). Satsuma and Clementine mandarins were nested in different groups. 'King' mandarin (Citrus nobilis Loureiro) late maturing and has large fruit cultivar found closely to Satsuma group. It was also reported by Coletto Filho *et al*. (1998) that genetic similarity among mandarins was over 0.77 and Satsuma and 'King' nested in the same gruop. Nicolosi *et al.* (2000) found that Satsuma and King closely related according to their RAPD and SCAR data. 'Kara' reported as a hybrid from 'Owari' Satsuma X 'King' (Hodgson, 1967), grouped closely to Satsuma mandarins according to SRAP data (Uzun, 2009). Low level of genetic variation found in most Satsumas and similarity level of nearly 50 accessions was over 0.98. They separated several group including 2-15 accessions and there was no genetic differences into the each groups. In another study, there was no variation among the 16 Satsuma mandarin and it was notified these genotypes obtained from mutations. In the same way, Fang and Roose (1997) found no differences in five Satsuma cultivars and Barkley et al. (2006), reported nearly all cultivars in the Satsuma group originated from mutations and they had same genetic construction. Hodgson (1967) classified Satsuma as separate group in the mandarins and notified that Satsuma naming as Citrus unshiu Markovitch. Also same researcher reported Satsuma was a nonstable group and lots of cultivars and genotypes had been occurred by variations in this group. In citrus many economically important genotypes are obtained from hybridization. In the mandarin group there are lots of hybrid accessions derived from mandarin x mandarin, mandarin x pummelo (as tangelo), mandarin x orange (as tangor) or mandarin x tangelo. According to SRAP data, all tangelos and tangors closely related to mandarin instead of orange and pummelo (Uzun, 2009). On the other hand, 'Ellendale', 'Ortanique', 'Mandora', 'Lake' tangelo, 'Orlando' tangelo (Fig. 1.), 'Thornton', tangelo, 'Seminello' tangelo, 'Sampson' tangelo and 'Robinson' and 'Nova' mandarins (both cultivars are result of Clementine X Orlando) grouped closely. 'Ortanique' and 'Mandora' were nearly identical and these cultivars were showed as synonym (Cottin, 2002). On the other hand, 'Ortanique' was reported as a natural hybrid between orange and mandarin (Hodgson, 1967). Also 'Robinson' and 'Nova' shared same parents had the high level of similarity. 'Dancy' mandarin separated clearly from other mandarins and nested alone in the dendrogram obtained by SRAP data (Uzun, 2009). According to Hodgson (1967), this cultivar classified as a species by Tanaka (1954) and originated from

Table 3. Summary of taxa in subgenus *Citrus*

Common name	Species name	Known age (years)	Probable origin	Seed reproduction	Genetic diversity
Citron	*C. medica*	2300	nonhybrid	sexual	moderate
Grapefruit	C. paradisi	200	hybrid	nucellar	low
Lemon	*C. limon*	800	hybrid	partly sexual	moderate*
Lime	*C. aurantifolia*	700	hybrid	partly sexual	moderate*
Mandarin	***C. reticulata***	**unknown**	**nonhybrid**	**variable**	**high**
Pummelo	*C. maxima*	unknown	nonhybrid	sexual	high
Sour orange	*C. aurantium*	900	hybrid	nucellar	low
Sweet orange	*C. sinensis*	500	hybrid	nucellar	low

**This extent of genetic diversity is due to combining different interspecific hybrids under a single species name.*

Source: Citrus Genetic Resources in California (Analysis and Recommendations for Long-Term Conservation).

India. 'Tankan', 'Ponkan', 'Minneola' tangelo (Plate 1), 'Encore' and 'Bower'clustered in same small group (Uzun, 2009). Also 'Sunburst' and 'Fairchild'found as closely related and clustered same group in other study (Barkley et al., 2006). 'Fairchild' was a hybrid of 'Clementine' X 'Orlando' and 'Encore' was a hybrid of 'King' X 'Willowleaf' (Hodgson, 1967). 'Fortune' as a hybrid between 'Clementine' and 'Dancy' (Hodgson, 1967), was found more related to 'Clementine' instead of 'Dancy' (Barkley et al., 2006; Uzun, 2009). 'Lee' as 'Clementine' hybrid clustered closely to 'Clementine' than other 'Clementine' hybrids such as 'Nova' and 'Robinson' (Uzun, 2009). Plate 1. 'Minneola' (left) and 'Orlando' (right) tangelos have same parentage (hybrid of Duncan grapefruit and Dancy mandarin) and contributed to the parentage of the such mandarin.

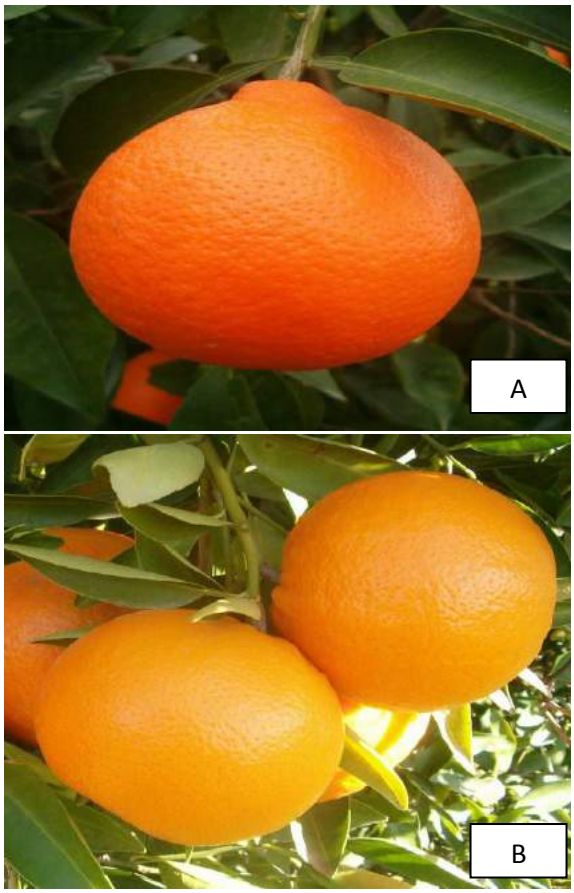

Plate.1 'Minneola' (A) and 'Orlando' (B) tangelos have same parentage (hybrid of Duncan grapefruit and Dancy mandarin) and contributed to the parentage of the mandarin.

4. SIGNIFICANCE OF POLYEMBRYONY IN CITRUS IMPROVEMENT

Among different types of polyembryony, nuceller embryony has a special significance as they originate from the mother tissue. Theoretically the entire nucellar seedling is genetically identical to the mother plant s so they can be used for the production of true to the mother type's seedling in the orchard (Button and Kochba, 1993). In spite of that nuceller seedling of citrus in general furnish better clones of orchard stock than those of conventional method of sexual and vegetative propagation because of the following reasons as selected by Hodson and Cameron (1938).

1. The nuceller seedling has a tap root and therefore, develops a better root system than do the cutting or air layering. The later has only small lateral root system.
2. The nuceller seedling shows a restoration of the vigour that normally found lost for the sapling developed after repeated propagation by cutting and air layering.
3. Chances of Propagule borne diseases can be minimized in the case of development of nuceller seedling.
4. Preservation of the state of heterozygosity. Nucellar embryony provides an opportunity for preservation and accumulation of mutant recessive gene, including genes detrimental to vigour and fertility .when such genes become abundant, nucellar polyembryony may tend to eliminate by gametic reproduction especially by self fecundation.
5. As virus particles are only restricted to the host vascular tissue, particularly the phloem, virus particles are eliminated from seedling ,offspring and nucellar embryos, hence are used to raise virus free seedling. Nuceller embryony is an inheritable genetic character, controlled by one or more number of genes (Parlevliet and Cameron, 1959).

These genes may regulate the pollen inhibition of embryogenesis in nucellus cells of monoembryonic citrus varieties. It was proved that seed storage protein was involved in this phenomenon (Koltunow *et al*., 1995).the available evidence on the initiation of the development of nucellar embryo indicates that pollination is usual, but perhaps not invariably necessary with certain interspecific hybrids, which rarely if ever produce zygotic seedlings, pollination seems to be necessary for the formation of nucellar embryos (Swingle, 1927). However Wakana and Uemoto (1987) proposed that nuceller embryos generation initiate without pollination but that fail to develop without endosperm development.

5. POLYEMBRYONY IN MANDARIN ORANGE

The degree of polyembryony within the mandarin cultivars was recorded as highly as variable trait. Some cultivars of the mandarin group were marked those produced only zygotic seedlings. While others produced mainly nuceller ones. The percentage of polyembryony in mandarin group varied from 10 to 100 (Toxopeus 1930, Torres, 1936). Frost and Soost (1968) identified King mandarin among the cultivars of mandarin group as mainly polyembryonic giving 1.10

embryos per seed and 1.03 seedling per seed. Kishiu was recorded as monoembryonic by them (1.00 seedling /seed).Other important members of mandarin group examined at that time like kuru, Satsuma, Szinkom and Ponkan showed higher degree of polyembryony (Frost and Soost, 1968). Frost and Soost (1968) also reported the percentage of nuceller seedling available from different cultivars of mandarin group of orange as represented in Table 4. Availability of number of seeds per fruit and zygotic seedling per seed of different mandarin orange cultivars was also mentioned in this table.4

6. MOLECULAR BASED APPROACHED

Conventional breeding methods have demonstrated limitations with respect to citrus improvement due to some of the biological characteristics of woody plants such as nucellar polyembryony, high heterozygosity, long juvenile period, and auto incompatibility. The development of biotechnological tools has made it possible to overcome some of these problems. In the specific case of citrus breeding programs, somatic hybridization and genetic transformation have been applied in many countries.

Crossing diploids (2x) of tetraploids (4x) to produce triploids (3x) has become a useful method for producing seedless citrus varieties (Soost and Cameron, 1985). One of the main problems found in citrus breeding programs is undesirable nucellar polyembryogenesis. Many polyembryonic tangerine varieties such as 'Montenegrina' and 'King' have been used in breeding programs. Consequently, the demand for methods to separate nucellar from zygotic embryos has increased.

Many studies aimed at separating the different types and varieties of citrus, as well as those aimed at separating nucellar and zygotic plants, started by utilizing morphological characterization spectrophotometer and chromatography techniques. Several biochemical methods, including enzymatic darkening due to polyphenols (Esen and Soost, 1974), have also been used. None of these methods efficiently confirmed the identity of true nucellar seedlings (Tusa *et al*., 2002).

Table 4. Number of Zygotic and Nucellar seedling of different types of Mandarin orange (Frost and Soost, 1968)

Seed Parent	No. of pollen cultivars	No of seeds studied	Seedlings per seed		Nucellar seedlings as percentage of all seedlings
			Total	Zygotic	
Dancy	6	193	1.29	0.00	100
Willow leaf	7	771	1.28	0.18	86
Kishiu	6	333	1.00	1.00	0
Ponkan	1	79	1.42	0.02	98
Kara	1	83	1.72	0.00	100
Szinkom	7	1638	1.50	0.25	83
King	7	387	1.01	0.80	21
satsuma	11	323	1.44	0.14	90

Later, isozymes were employed in plant breeding (Moore and Castle, 1988; Anderson *et al*., 1991). Nevertheless, because products of gene expression were used in those cases, results may be influenced by the environment or by the developmental stage of the plant and its organs, thus making this method unreliable for zygotic seedling identification. Recently, molecular marker techniques have been improved, enabling more specific and precise studies to be conducted. These new techniques are particularly advantageous for woody plants as they allow selection in much shorter time periods than previously possible.

The use of DNA polymorphisms for the identification of hybrid seedlings is important in citrus breeding programs as it accelerates the process of progeny screening. Among DNA-based methods, random amplified polymorphic DNA (RAPD) analysis is one of the most widely used for differentiating hybrids in citrus breeding programs (Vilarinhos *et al*., 2000). A number of recent studies have also described the use of SSR markers as an alternate method to distinguish sexual from nucellar citrus seedlings (Oliveira *et al*., 2002).Zygotic and nucellar embryos could be differentiated with the development of isozyme techniques (Torres *et al.*, 1978). Random amplified polymorphic DNA markers (RAPD) have been widely used in citrus because of their assumed phenotypic neutrality and their ability to quickly and easily reveal a large number of markers. The technique has been used mainly for genotype typification, phylogenetic studies, mapping and mutant identification (Luro *et al.*, 1995; Deng *et al.*, 1995). The RAPD technique does not need previous information about the targeted DNA and shows great polymorphism.

An attempt to initiate characterization of plant types of Himalayan region 26 plant types and then 17 plant types were selected for physic-chemical analysis and phenotypic variation was reported (Das *et al.* 2003, 2004). 25 elite clones of Citrus reticulata were characterized with RAPD profiling showing a genetic variability of 65% with accurate clustering of the genotypes in two large groups (Das *et al*. 2004). Genetic diversity analysis of citrus cultivars and root stocks of North Eastern India by RAPD markers was performed by Das *et al.,* 2005.

6. CONCLUSION

In this dissertation work an attempt was taken to differentiate nucellar and zygotic seedlings at molecular level. Previous literature stated the morphological separation of zygotic and nucellar embryo is not always correct. The detection of zygotic twin and triplet in mandarin orange population actually complicates the process. The poor farmers of North Eastern Hilly region usually scatter seed in seed bed and rogue the off type seedling. The occurrence of significant number of zygote abnormality could decrease the nucellar percentage and its identification. In a open pollinated population the morphological identification of nucellar embryos become more difficult. Keeping these points in mind DNA based molecular marking system is used for differentiation of hybrids from the nucellar.

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Balanced Amino acids Nutrition for poultry bird

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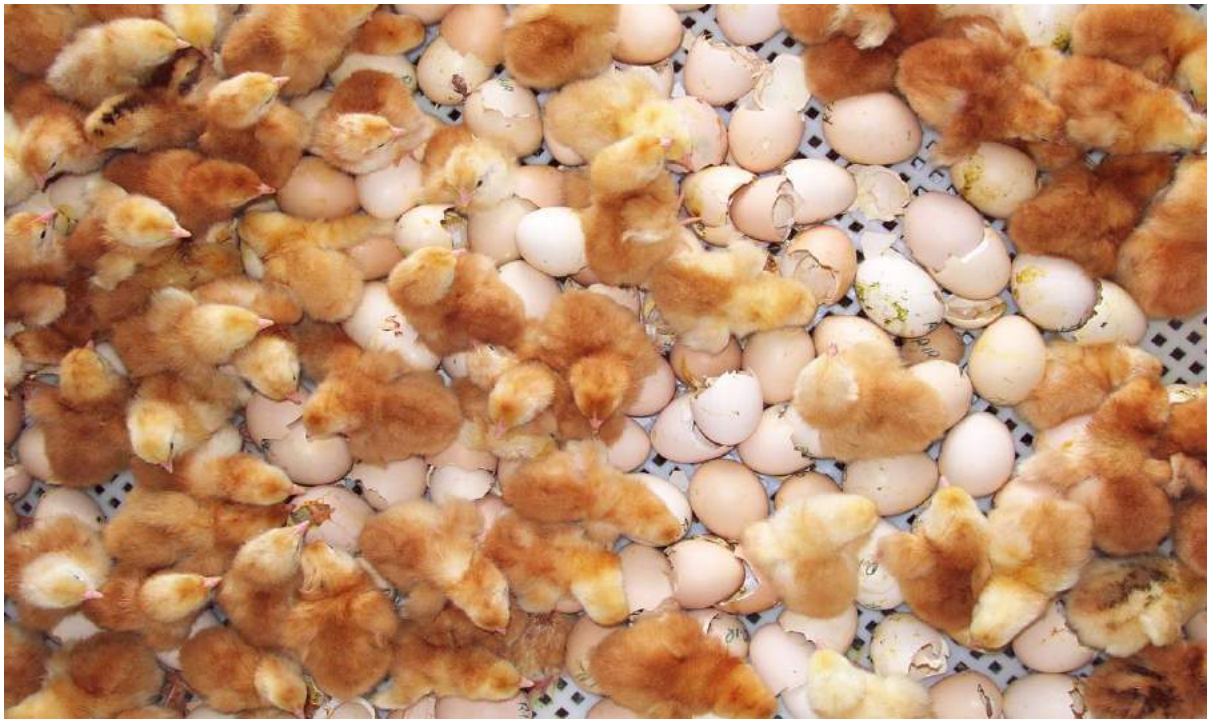
Mere fulfilling the protein requirement of the birds is not enough until it meets the necessary essential amino acids needs at required quantity without excess or deficiency of it is very important. A constant supply of Amino acids is important for the growth and egg production. The Common practices of using maize and soybean based diet in poultry have limiting amino acids methionine, lysine and fallowed by the tryptophan. Most of the cereals are rich in non-essential amino acids. Essential amino acids must be supplied through feed since their synthesis in the body is not up to the requirement for the growth and production. Feed should not be free from the non-essential amino acids, which will divert the essential amino acids to synthesize non-essential amino acids through transamination process. Deficiency of single or multiple amino acids decreases feed intake and growth rate. Excess of any amino acids results in deamination and excreted as a nitrogen in the faces as a waste. Amino acid requirements of the bird's dependence on many factors such as environmental temperature, the genetic background of birds such as different strains and lines, the health status of the bird's, disease or stress condition and dietary practices. Dietary factors such as availability of dietary amino acids, interaction among the amino acids, imbalance, antagonism or toxicity, dietary energy and crude protein content of the diet place very important role. The exact amino acid requirement in proportion with its agonist or antagonist amino acid estimation resulted in the concept of ideal amino acid feeding. The Ideal amino acid is a mixture of all essential and non-essential amino acids in a proper proportion for the efficient utilization of protein for the growth and production.

FACTORS AFFECTING AMINO ACID REQUIREMENTS

Genetic factors



Strain is the most important factor affecting the amino acid requirement. Higher producing strains have the higher requirements. Certain strains have more requirement of particular amino acids such as strains having more arginase activity require more arginine requirement, broilers with high growth rates have low renal arginase activity. Lines with different lysine ketoglutarate reductase activity have different lysine requirement.

Age

The requirement also depends on the age and it is generally considered that they decrease as the bird matures. However, this is not true for all amino acids. Lysine and methionine requirement decreases with age.

Dietary protein

Requirement varies with the protein and energy content of the diet. The interaction between the protein and energy content will also affect the requirement. Dietary amino acids play important role in feed intake, the moderate deficit in all amino acids can provoke an increased consumption, as though the birds tries to compensate for the deficiency by increasing amino acid intake. As a result, the carcass becomes fatty by increasing abdominal fat. Increased consumer awareness doesn't prefer such a birds. Fattening the muscle which means increasing the intramuscular fat will add taste, wateriness, tenderness and increases the overall acceptability of the consumer, which is possible by maintaining the balanced amino acids in the protein supplement. Poorly balanced protein diet will affect the utilization of limiting amino acids. Reduced net energy resulting from an increase in gluconeogenesis from poor quality diet results in increased catabolism of limiting amino acids from muscle in order to maintain homeostasis of plasma amino acid level.

IMPORTANCE OF AMINO ACIDS AND THEIR INTERRELATIONSHIP

Amino acids greatly influence the feed intake and efficiency of utilization. Dietary protein content can be reduced by adding limiting amino acids in the diet. Alanine acts as a substrate for the hepatic synthesis of glucose, arginine promotes the secretion of insulin, growth hormone, prolactin and insulin-like growth factors. Glycine chemically serves as the potent antioxidant and scavenges the free radicals. Methionine and lysine are most important for the protein synthesis and lean meat production. All most all amino acids mostly arginine, glutamine, and cysteine involved directly or indirectly in activation of T- lymphocytes, B – lymphocytes, macrophages, production of antibodies, cytokines and other inflammatory mediators and acts as potent immune modulators. Extra protein addition in heat stressed birds in summer is a taxation on energy and further, it leads more stress in birds, this can be controlled by limiting the protein supply with added required essential amino acids. Care should be taken while including the amino acids and should have knowledge about the imbalance, antagonism, and toxicity of the amino acids interrelationship. Methionine and cysteine are interrelated, methionine can donate methyl group for trans methylation reaction for the synthesis of choline, betaine, and sarcosine. After losing methyl group it converted to homocysteine which will combine with the serine to synthesize cysteine. Two cysteine molecules derived from two methionine molecules combines to form cysteine. Dietary requirement of cysteine can be met through the methionine supplementation whereas the reverse is not true. Phenylalanine metabolism results in the production of tyrosine and its requirements can be fulfilled through the phenylalanine. Serine and glycine are mutually synthesized from each other. Amino acid antagonism between amino acids exists due to the presence of similar structure or chemical characteristics. Common antagonism existing among the amino acids in poultry are leucine - isoleucine - valine, lysine - arginine and threonine - tryptophan. Protein rich in single amino acid may create the deficiency of the other amino acid.

Lysine – arginine antagonism

Lysine: arginine ratio of 1.2 reduces the growth rate of birds. Increased lysine increases the arginase activity at the kidney and induces the arginine degradation. Feed with threonine, α-aminobutyric acid, and glycine reduces the arginase activity and counteract the excess lysine. However, arginine in excess will not create such a growth depression and need not to be corrected with the lysine.

Leucine - Isoleucine – Valine

Leucine, isoleucine, and valine are the aliphatic side chain containing amino acids vary in there side chain groups. Absorption metabolism of these amino acids occurs through the same pathway so an excess of one will affect the absorption and utilization of the other amino acids of the same group. Maize gluten meal and blood meal are rich in leucine, feeding in birds in excess effects the feed intake and growth it can be corrected by the supplementing the isoleucine and valine. Excess leucine causes the increased muscle branched chain amino acid transaminase significantly resulting in the catabolism of other branched chain amino acids.

GLYCINE, SERINE, AND METHIONINE

Excess Glycine in the diet will affect the growth rate of the bird's addition of methionine will compensate the negative effect of excess glycine. Mere supplementation of glycine even at proper proportion will not improve the growth rate, simultaneous supplementation with choline induces the growth rate and weight gain. A Similar effect also was seen when choline and serine supplementation was done together so that serine can replace the glycine content, glycine will become indispensable only when the diet is deficient in serine or choline.

Methionine, Glycine, and Arginine

The methionine- glycine- arginine interaction in chicks appears due to increased creatinine formation. This interaction may result in loss of methionine due to increased demand for methyl groups in the conversion of guanidinoacetic acid to creatine.

Sulphur amino acids

The relationship between the cystine and methionine in higher animals is well known. In birds minimum cystine has to be present in the diet for the growth of feathers. Even though methionine is transformed to cystine but only about 79% is the efficiency of it. Methionine alone requirement is about 0.63 to 0.70 per cent although it is only 0.52 per cent in a mixture of methionine and cystine. However, these values will be much closer on the basis of total sulphur amino acids intake 475 and 495 mg/day of cystine and methionine respectively.

EXCESS OF AMINO ACIDS

Usually, excess of amino acids situation will not occur in Indian feeding condition. Faulty feeding may result in a situation such as toxicity due to excess amino acids. In the case of relative excess, amino acids will not be used for growth but will be degraded and excreted as nitrogen or transformed to nonessential amino acids. Excretion of nitrogen in the form of uric acid in birds is taxation on energy and results in metabolic stress in the birds

affecting the growth and production level. When birds are given the chance of selecting among the excess threonine and control diet, chick preferred control diet indicating that imbalanced diet strongly inhibiting the dietary intake.

Some studies suggested that amino acid requirements are expressed in terms of percentage of diet and will increase with an increase in protein level. Dietary lysine requirement increased from 0.85 to 1.35 % as protein level increased from 20% to 40% level which will results in excess amino acids causing imbalance. Which can overcome only by supplementing first limiting amino acid. Excess lysine and leucine in the diet primary effect on decreased growth rate later after 6 days feed intake starts decreasing. Increased methionine content of the diet affects the body composition without any effect on the feed intake. However, cystine causes an increase in feed intake. In addition to the effect on feed intake and growth rate change each amino acids having its own metabolic pathway will induce characteristics effects. Excess of methionine greater than 0.7% causes growth depression in broiler birds this can be alleviated by the addition of threonine, glycine, and serine.

IDEAL AMINO ACID CONCEPT

Concept of ideal amino acids was first developed by Mitchell and Scott in 1950. The main goal of ideal protein feeding was to provide a combination of dispensable and indispensable amino acids that precisely meets a bird's requirement for protein accretion and maintenance while avoiding deficiencies or excesses. Achieving this concept is difficult. To use the ideal protein concept in diet formulation, all of the indispensable amino acids are expressed as ideal ratios, or percentages, of lysine.

Importance of using ideal protein concept

- The cost of protein and amino acids are the critical in feed formulation, selecting the required quantity and quality saves the cost involved in feed formulation.
- Prevent environment pollution through controlled release of excess nitrogen to the environment.
- Avoid heat stress in birds due to metabolism and inefficient process involved in incorporation of amino acids into body protein and egg from the protein derived from the poor quality source.
- Excess protein unutilized nitrogen converted into nontoxic uric acid and excretion of it requires a lot of metabolized energy which is a wasteful process.

Formulating ideal protein concept feed

- During the formulation of ideal protein lysine is used as a standard for expressing the requirement of other essential amino acids because of several reasons such as 1) lysine is the second limiting amino acid after methionine in broiler diet, 2) lysine analysis in feedstuff is easy 3) lysine is not a precursor for any compound and directly used for maintenance and growth. 4) Lysine content of feedstuffs and body composition is readily available.
- Formulating the feed should be based on the digestible protein and amino acid rather than using poor quality protein. But NRC, 1994 recommendations of amino acids in poultry are not based on the digestible

amino acids and it is based on only total amino acids.

- Selected protein from different sources should have complementary amino acid balance and utilize commercial amino acids to balance the requirements.
- Detailed information about feed ingredients used in feed formulation and there contribution towards the amino acid pool should be established, Most of the cereals are deficient in lysine and threonine, maize deficient in tryptophan. Legumes are low in methionine and cysteine.

CONCLUSION

Feeding of birds based on the amino acid content of feed place a crucial role than crude protein content. Ideal mixture of amino acid feeding is a cost effective process, avoids the wasteful process of energy and helps in efficient utilization feed and genetic potential of the birds.

Common Health Problems of Dogs

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Dog is a working companion, champion show animal, hunting partner, or just a best friend. The kindest and most responsible thing we can do for him is that we can provide proper health care. Knowing about common dog diseases and being aware of appropriate prevention and treatment can better help us in providing that care. Some of the most common and serious dog diseases have been made less common through vaccines: however, these diseases continue to threaten a dog that lacks proper immunization. Puppies many be vaccinated as early as 4-6 weeks depending on each situation and the veterinarian's advice. Some of the diseases can be prevented through vaccinations.

1. CANINE PARVOVIRUS

Canine parvo vrus infecton is a very common enteric disease usually attacking pups between weaning age and six-months-of age and pups usually remain somewhat unhealthy and weak for life

Causes

Transmission occurs when dogs come in contact with the bodily fluids of infected animals

Symptoms

Common symptoms are bloody diarrhea, diarrhea is foul smelling and sometimes yellow in color, vomiting, high fever, lethargy.

Prevention and treatment

There is no known cure for the disease. Use supportive therapy involving giving fluids, regulating electrolyte levels, controlling the body temperature and giving blood transfusions. Vaccinate starting when pups are six-to-eight-weeks old.

2. CANINE DISTEMPER

Considered the most serious viral disease of dogs. About 50% of non-vaccinated, non- immunized dogs with the disease will develop the symptoms of the disease of those, about 90% will die. More common in pups younger than three months old.

Causes

Canine distemper is caused by a virus closely related to the human measles virus and its a highly contagious disease contracted through the air and contact

Symptoms

fever and depression, vomiting and bloody diarrhea, coughing and labored breathing, fits and nervous twitching, paralysis, inflammation of tissues around the eyes and nose, can also cause a hardening of the nose and pads.

Prevention and treatment

Vaccine for the disease should be administered every three to four weeks from six to 16 weeks of age with annual boosters.

3. INTERNAL PARASITES

Roundworms live in dogs intestines and consume partially digested feed, Passed by feces, offspring to offspring

Symptoms

Loss of appetite, pot belly, vomiting, diarrhea, roundworms, pale gums, weakness, failure to grow properly, dull coat, lack of energy, coughing.

Treatment

Dewormer (cantel/drontal/plozin) repeat after every 3 months in adult dogs. From

the age of 3 month to 6 months deworming should be done monthly.

4. SKIN DISEASES

Commmon cause of major skin diseases are scabies (sarcoptic mange), demodectic mange (red mange), bacterial infection (may be due to malnutrition), flea infestation, ringworm, severe allergies, hormonal imbalance – low thyroid, high adrenal activity (cushing's disease), diabetes.

Symptoms

Itching, scratching rashes, pustules, red bumps (papules) and crusting, Red skin and hair loss, not usually itchy, (localized) or over entire body (generalized) and hair loss in ring formation.

Treatment

Medicated shampoo and Creams, pyrethrin sprays, dips (safe for pups). And control fleas in the environment. Fipronil spray (Over and Out) last long periods of time. Mitaban (Amitraz, Taktic) dips, dose of ivermectin (NOT IN COLLIES) can also be use.

5. EAR INFECTION

Are a common problem in dogs, especially those breeds with a heavy earflap. Infections are caused by bacteria or yeast that grow in the ear when the ear's normal environment is changed for any reason. Ear mites, ticks, and water or grass awns in the ear can be predisposing factors.

Signs and symptoms

Signs of ear infections are head shaking, pawing or digging at the ear, pain, redness, and inflamation of the ear canal, and a foul smell in the ear. Any ear infection should be examined by a veterinarian for proper treatment.

Treatment

Examine your dog's ears at least once weekly. Try to prevent water from getting in your dog's ears when bathing the dog. Ask a veterinarian for advice on wax control and routine ear cleaning.

6. RABIES

Is the oldest and most well known of canine diseases**.** Primarily attacks the nervous system and causes encephalitis**.** Is detected only by examining the brain, after death, for signs of infections

Causes

Disease is transmitted by body fluids, urine, saliva and blood and primary source of rabies is the bite of a rabid animal

Symptoms

Death occurs three to seven days after signs begin to show. Three phases of the disease exist; Prodomal stage, furious stage, paralytic stage. Prodomal stage lasts two to three days and symptoms include behavioral changes, fever, slow eye reflexes,chewing at the bite site Furious stage lasts two to four days and signs include irritability restlessness barking, aggression, vicious attacks on inanimate objects, unexpected roaming Paralytic stage lasts two to four days, paralysis develops, depression, coma, death from respiratory paralysis.

Prevention and Treatment

Dogs are easily vaccinated and in most countries and cities require dogs should be vaccinated. One of the highest compliance rates of all routine dog vaccinations all dogs should be vaccinated.

7. CHERRY EYE

Prolapsed nictitating membrane (3rd eyelid), hereditary weakness of the connective tissue.

Symptoms

Visual redness, 3rd eyelid becoming visible.

Treatment

Best treatment is surgical removal of membrane.

8. ANAL SAC BLOCKAGE

Anal sac blockage causing considerable animal discomfort. Anal glands may become infected, causing drainage and foul odors at times. The dog may exhibit uneasy behaviour such as rear-end scooting or nipping at the tail area.

Symptoms

Swollen anus, foul smell, scratching and biting, trouble defecating, snal sac blockage.

Treatment

Squeezing the gland with cotton and surgical removal.

9. HIP DYSPLASIA

Abnormal formation of hips. Degenerative breakdown of joints. Completely genetic and passed down for offspring to offspring.

Symptoms

Dog will rather sit than stand. Slow getting up, stiff, young dogs, pups will run with back legs together.

Treatment

Manaual backward and inward traction is

applied after giving proper anaesthesia, if not comes n position surgery is done.

10. ARTHRITIS

Inflammation of the joints, two types: Degenerative and Inflammatory, degenerative, destruction of cartilage that protects the bones, stress, dysplasis, inflammatory and Causes by infection or immune-mediated disease and affects multiple joints.

Symptoms

Reluctance to walk, climb stairs, jump, limping, lagging, difficulty rising

Treatment

Pain Killers, exercise, rest and surgery in some cases.

11. CATARACTS

Cataract is a clouding of the normally clear.

Causes

Most are genetically transmitted and other reasons are age-related, trauma, dietary deficiency, electric shock, toxin.

Symptoms

Bumping into objects, failing to retrieve favorite toys, fear of being left alone.

Treatment and prevention

Surgery is the only way to remove cataracts. An intraocular lens is implanted during surgery. 90 to 95% of patients have good to excellent vision after surgery.

12. INFECTIOUS CANINE HEPATITIS (ICH)

Is an extremely contagious viral disease affecting the liver and other organs.

Causes

Cause is direct contact with an infected animal or contaminated objects and also can be transmitted by inhalation or from fleas, ticks and mosquitoes.

Symptoms

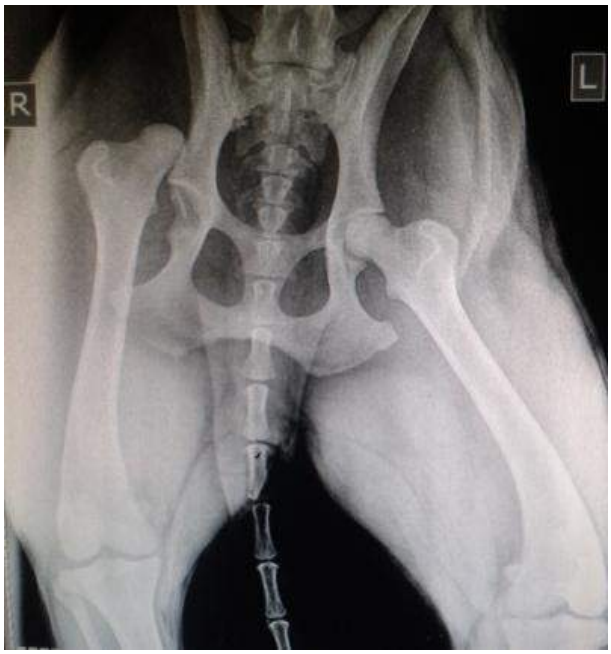
Can range from mild to severe and nausea, vomiting and loss of appetite, jaundice, bleeding from the nose and gums, bloody vomit and diarrhea, enlarged abdomen, disorientation, seizures and coma, death occurs within five days. ¼ of infected dogs develop a temporary clouded cornea

Treatment

No known cure for the disease. Use intravenous fluid replacement, fasting, blood transfusions, antibiotics and eye drops as supportive treatments. Vaccinaton includes injections at 10 weeks, 14 weeks and then yearly boosters.

13. CANINE HYPOTHYROIDISM

Canine Hypothyroidism is the most commonly diagnosed endocrine disease of dogs. Is underproduction of the hormone thyroxin, which is produced by the thyroid gland, thyroxin controls growth and maintains normal protein, carbohydrate and lipid metabolism. Mostly occurs between two and six years old.



Causes

Most cases are due to genetic makeup cause and other cause include surgical removal of the gland, cancer, low iodine in the diet.

Symptoms

Increases body weight; most common, develops a skin disease, decreases exercise and becomes lethargic, develops reproductive problems, is often called the great imitator because it shows disease symptoms for other diseases.

Treatment

A thyroid hormone supplementation is given orally once or twice daily.

A Stem Cell Discovery-

Advantages In Animals

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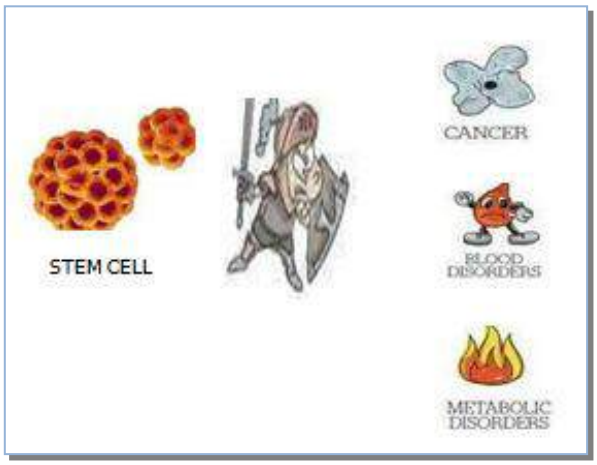
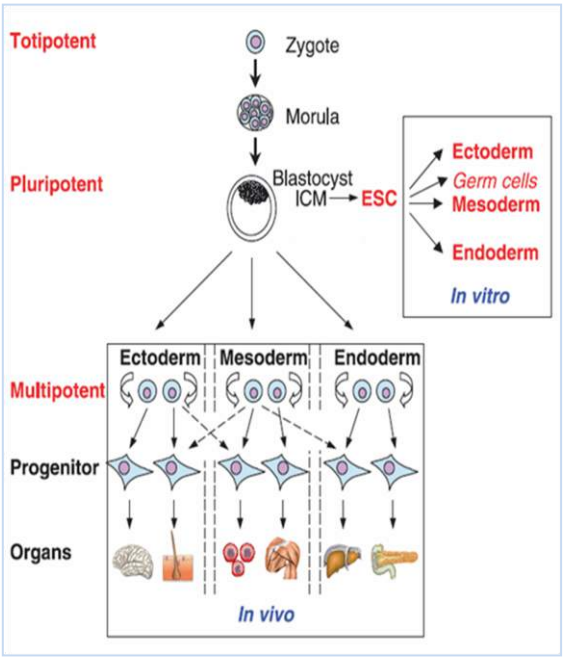
Stem cells are master cells with two important characteristics, unspecialized cells capable of their own renewal and ability to differentiate into different cell types. The establishment of embryonic stem (ES) cell lines obtained from mouse [Evans and Kaufmann 1981, Martin 1981]. The idea of cell therapies based on an unlimited self-renew potent source of cells have become an attractive concept of regenerative medicine [Wobus and Boheler 2005]. Isolation of pluripotent cells from inner cell mass (ICM) of early embryos faces serious ethical concerns. To circumvent this, much effort has been done into generation of pluripotent cells via reprogramming of somatic cells.

The stem cells may have various differentiation potentials viz. totipotent, pluripotent, multipotent, unipotent. Stem cells can be classified into four broad categories, based on their ability to differentiate. Totipotent stem cells are found only in early embryos. Each cell can form a complete organism (1-3 days). Pluripotent stem cells exist in the undifferentiated inner cell mass of the blastocyst (5 to 14 days) and can form any of the over 200 different cell types found in the body. Multipotent stem cells





are derived from fetal tissue, cord blood, and adult stem cells. These cells are differentiated, but can form a number of other tissues. stem cells can form multiple types of cells and tissue types. Unipotent stem cells able to contribute to only one mature cell type but have the property of self-renewal which distinguishes them from non-stem cells

To achieve this, the following methods can be used

1. Somatic cell nuclear transfer (SCNT) [Wilmut *et al*. 1997]
2. Fusion of somatic cell with pluripotent cell [Silva *et al*. 2006]
3. Culture of somatic cells with cell extracts isolated from embryonic stem cells [Xu *et al*. 2009] or oocytes [Miyamoto *et al*. 2009]
4. Generation of induced pluripotent stem cells by defined transcription factors (Takahashi and Yamanaka 2006).

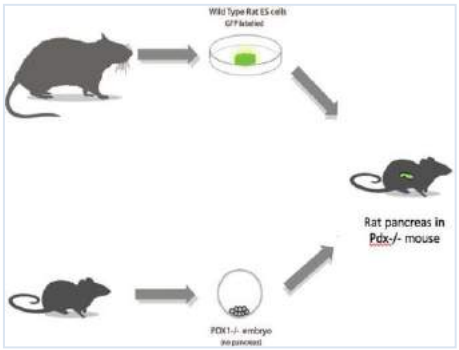
Types of stem cells

Embryonic stem cells	Adult stem cells
Derived from ICM/epiblast of Blastocyst	Long-term self-renewal
Pluripotent	Give rise to mature cells having characteristic morphologies and
Long-term self-renewal	Dispersed in tissues throughout the body
Exhibit and maintain a stable diploid normal complement of	

Stem cells speciality is that they show no apoptosis in stem cells and no shortening of telomere in stem cells

Discovery of Induced pluripotent stem cells (iPSCs)

Embryonic stem cells (ESCs), which are derived from the inner cell mass of blastocyst stage embryos, have the unique ability to self-renew indefinitely as well as the capability to differentiate. But there are limitations that must be overcome, such as immune rejection and ethical issues surrounding the use of embryos as an ESC source. A major advance in the stem cell field was the conversion of somatic cells to an embryonic stem cell state, which was named as induced pluripotent stem cells (iPSCs), using defined transcription factors. (Yamanaka *et al.,* 2006). iPSCs can avoid immune rejection, since cells are derived from a patient's own cells, as well as any ethical issues regarding the use of human embryos. The characteristics of iPSCs are also very similar to those of pluripotent ESCs. Karyotyping analysis demonstrated that bovine iPS cells showed a normal chromosome number and were able to differentiate to three



germ layers in vitro and in vivo. In goat, iPS cells were successfully generated from primary ear fibroblasts showing a morphology similar to mouse embryonic stem cells. [Ren *et al*. 2011] In sheep iPS cells were generated from fibroblasts reprogrammed to pluripotency by defined factors (Oct4, Sox2, Nanog)

Advantages of Induced pluripotent stem cells

iPSCs can be readily isolated from a skin biopsy, simplifying the generation of patient-specific pluripotent stem cells. In addition, the use of patient-specific iPSCs in cell-based therapy should reduce the risks of immunological complications post-transplantation, and therefore avoid the drugs to prevent rejection. (Lian *et al*., 2010)

Applications of stem cells in animals

1. Cardiac defects : Laflamme *et al.* (2005) injected ESC into the left ventricular wall of athymic rats and found that grafts consisted predominantly of cardiomyocytes by 4 weeks.
2. Spinal injuries : Acute spinal injuries are common in canines and felines that lead to loss of tissue. transplantation of stem cells with the ability to differentiate into neurons and supporting cells may be a practical method for recovery.
3. Cartilage Defect: Mouse ES cells (AB2.2 or CCE cells) were transplanted into articular cartilage defects in the patellar groove of immunosuppressed rats and cells were observed 8 weeks after transplantation. Cells produced cartilage resulting in repair of defect.
4. Tendon and ligament repair: Bone marrow derived stem cells were used to repair surgically induced patellar tendon defect. The bone marrow components were injected for recovery from ligament injuries in 100 horses and found effective. (Herthel *et al.,* 2001)
5. Bone repair: The preclinical studies were carried out in laboratory animals like rat, rabbit. Canine segmental bone defects were treated wiith bone marrow derived stem cells.
6. Creating human organ in chimaera pigs: Induced pluripotent stem cells generated from somatic cells taken from intended recipient and human cells injected into pig embryo. Embryo implanted in sow following gestation, birth, rearing of donor pig and then sacrifice of pig and transplantation of human organ into recipient
7. Transgenic animal production: Bovine iPSCs may enhance the ability to develop transgenic cattle for the production of therapeutic proteins in milk, to introduce disease resistance and other valuable traits (Plews *et al*., 2012).
8. For drug development and screening: One potential benefit of iPSC technology is that it may allow for the creation of a library of animal cell lines that covers the major genetic and epigenetic variants within a species.The use of such cell lines in screening assays should help to drive more efficient and predictive drug discovery and toxicity studies. In particular, availability of hepatocyte- like cells derived from iPSCs, as reported for the pig by Aravalli *et al*. (2012), would be of great value for studying drug toxicity and metabolism.
9. As Animal models: Mouse Although the mouse is still by far the most commonly used animal in biomedical research, studies into cell regeneration and gene therapy in laboratory rodents. Zhu *et al.* (2011) produced insulin-producing cells from rhesus monkey iPSCs and demonstrated their functionality (insulin secretion) in approximately 50% of mice receiving a transplant.

Pig are attractive alternatives because they present fewer ethical dilemmas and lower economic costs. Biologically and anatomically, pigs are relatively similar to humans, and are therefore a meaningful model in many fields of medicine, including transplant biology, immunology, and cardiovascular surgery (Kues and Niemann, 2004).

The dog is often advocated as a logical model for studying hereditary and chronic diseases. Although biotechnological techniques and tools for the dog are less well developed than for other species, recent developments such as the derivation of canine iPSCs by four different research groups. Autologous iPSCs were recently transplanted into the myocardial wall of dogs to examine the potential for myocardial infarct treatment (Lee *et al*., 2011).

Sheep is considered a cheap and easy-to-handle animal species and has been used to study respiratory diseases and their treatment.

Horse is considered an ideal animal model for testing cell therapy for musculoskeletal injuries such as cartilage damage or degeneration, since the structure and matrix composition of tendons and nature of joint and tendon injuries in the horse closely resemble those in man (Nagy *et al*., 2011).

Stem cells are undoubtedly, most promising for cell-based therapies thereby provides a powerful and flexible option for veterinarians to restore function and improve animal health through the novel techniques. The production of iPSCs for domestic animal species is an exciting reality with preliminary biomedical applications. The use of large animals to model novel treatments for humans may provide evidence for the feasibility of iPSC-based therapy. At the same time, iPSC studies in domestic species could improve our understanding of the potential benefits of iPSCs in veterinary medicine. Stem cells are mainly used for the treatment in canines and equines whereas research is still going on in farm animals.

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Scientific Advancements in Veterinary Practice with Phytochemicals

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Thomas Alva Edison, renowned nineteenth century inventor, once aptly quoted, "*Until man duplicates a blade of grass, nature can laugh at his so-called scientific knowledge. Remedies from chemicals will never stand in favour compared with products of nature, the living cell of the plant, the final result of the rays of the sun, the mother of life.*"

These words of wisdom pertinently reinforce the essentiality of Mother Nature and her blessing in form of precious products like plants for the well being of human as well as animals domesticated by them. Phytochemicals are the naturally occurring non-nutritive chemicals present in plants which have protective or disease preventive properties. They functionally operate via Antioxidation - Most phytochemicals have antioxidant activity and protect the cells against oxidative stress damage and reduce the risk of developing certain types of cancer. Phytochemicals with antioxidant activity: allyl sulfides (onions, leeks, garlic), carotenoids (fruits, carrots), flavonoids (fruits, vegetables), polyphenols (tea, grapes). Stimulation of enzymes - Indoles, which are found in cabbages, stimulate enzymes that make estrogen less effective and could reduce the risk for mammary tumors. Other phytochemicals which interfere with enzymes, are protease inhibitors (soy and beans). Hormonal action - Isoflavones, found in soy, imitate human estrogens and help to reduce menopausal symptoms and osteoporosis. Interference with DNA replication - Saponins found in beans interfere with the replication of cell DNA, thereby preventing the multiplication of cancer cells. Capsaicin, found in hot peppers, protects DNA from carcinogens. Anti-bacterial effect - The phytochemical allicin from garlic has anti-bacterial properties. Physical action - Some phytochemicals bind physically to cell walls thereby preventing the adhesion of pathogens to cell walls. Proanthocyanidins are responsible for the

anti-adhesion properties of cranberry. Consumption of cranberries will reduce the risk of urinary tract infections and will improve dental health. The functional properties of phytochemicals were tapped by man since time imemmorable. At early stages hit and trail or crude method was used to come up with variegated combinations of ingredients used against a particular malaise or for a favoured enhancement in body condition of animals. After attaining a desirable amalgam ingredients refinement was achieved in these modus operandi over a considerable time. Administering of *Fenugreek(methi), Jaggery and pearl millet* to an animal which has recently calved for an early involution and uterine health, provision of *Henna(mehndi)* to an animal affected by heat wave and diarrhoea for its soothing and coolant properties, provision of *Mustard oil* to a young suffering from indigestion, etc. are some out of the innumerable practices followed by animal owners in day to day life.

MAJOR PHYTOCHEMICALS AND THEIR USES

There is an array of phytochemicals present in different plants exploited for curative action against maladies and performance enhancing benefits. Some of which are *Withania somnifera*- It is also known as 'Ashwagandha' which has the meaning "offering strength to horse" in Sanskrit. It is excellent for building immunity to cattle & pets. It also adds healthy weight to the cattle and beneficial in curing arthritis in animals. When fed to the milk producing cattle enhances the milk production. Thus it is very profit-yielding for cattle rearers. *Asparagus racemosus* vernacularly known as 'Shatavari' is one of the best herbal extracts for maintaining the health of cattle. It prevents ulcer in animals and posses remarkable antiphalogistic properties. It also inhibits the production of excessive gastric hydrochloric acid in animals hence is useful in prevention and treatment of gastric problems in cattle and pets. Asparagus extracts is also beneficial for milk producing cattle as it boosts the milk secretion. *Leptadenia reticulata* or 'Jivanti' is one of the best herbal extract for milk yielding cattle. It is very useful in easing the heat symptoms in cattle. It not just helps in yielding more milk but also helps in getting good quality thick milk. It also helps in decreasing the timing between the inter-calving periods. It can also be given to calf for its healthy growth. *Breynia patens* It is also called as 'Kambhoi' is very useful in easing the symptoms of lactating cows hence are used widely by the cattle rearers. It nourishes the cattle and makes them strong. *Citrullus Colocynthis* also known as 'Vishala'. It is an excellent cure for digestive issues in cattle such as constipation. This is because it offers a strong laxative effect. *Abrus precatorius* is used as Abortifacient for pet animals or domestic animals. It is used in preventing unwanted offspring birth in animals. It must be however used under the guidance of Veterinary doctors or specialist. It is locally called as 'Ratti'. *Acacia catechu* This herbal extract is very ideal for cattle and pet animals. It prevents dysentery and diarrhea problems in animals because it is a natural anti-diarrhoeal and cytoprotective drug. It is also called as 'Gum babul'. It is used stomach upset and

pain. It is also very useful in increasing milk yield in cattle. *Sida cordifolia* is also called as 'Bala Beej'. It is very useful in preventing and treating respiratory problems like cold in animals. It also soothes the nervous system of pets and help to keep them active and energetic to cure any diseases related weakness. *Randia dumetorum* is also known as 'Mindha'. It is very rich in anti-oxidants and is one of the potent herbal liver care products/medicines especially for animals. It is not just protects the liver but also boost its normal functioning in case of animals affected by jaundice. *Tephrosia purpurea* It is also identified as 'Sarpankho'. It eliminates hepato-toxins in case of animals affected by jaundice or hepatitis. It regulates the normal liver functioning in the animals. It also eases the symptoms of affected liver during the disease. *Eclipta alba* commonly called 'Bhangro' Extracts are very popular among the cattle rearers because of their capability of healing liver infections and hepatitis in cattle. They are used for domestic animals and pets too. *Cichorium intybus extracts* or 'Kasni' is an excellent remedy for enlarged Spleen. It is a good anti-inflammatory product. It is useful in curing acute pancreatitis. It also has anti-hepatotoxicity quality and is rich in antioxidants. It has the ability to protect gastric system. *Phyllanthus niruri* is an excellent Anti-hepatotoxic. It eliminates toxins of liver and is useful in treating jaundice in animals. It is locally called as 'Bhoiamli'. *Holarrhena antidysenterica* Its common name is 'Kadu'. It is anti-dysentery in nature and hence is useful in curing dysentery and diarrhoea. It is useful in treating wide variety of gastric diseases also. *Andrographis paniculata* It is commonly identified as 'Kariyatu' is not just a good cure for jaundice and hepatitis as well as liver problems in animals but also a good Hepatoprotective. It is Anti-viral in nature and protects animals from influenza and other viral diseases. *Terminalia Arjuna Extracts* is also called as 'Arjun'. It is useful in treating a vast variety of diseases and boosting the immune system of animals. It helps in healing fractures. It functions as an Antiarrhythmic, very useful as Cardio vascular support. *Solanum nigrum* is also identified as Liver Tonic which means it keeps liver healthy and is very useful for animals sick due to jaundice and also hepatitis. It moreover helps in recovering and regular working of liver. It is also called as 'Makoi'. It also props up drainage of mucus in sick animals by diluting the mucus and helps the discharge of phlegm and lubrication of the aggravated respiratory tract. *Boerhaavia diffusa* is locally recognized as 'Punarnava'. It functions excellently as a Diuretic. Which means it is functional in getting rid of superfluous water and salt via urine. This elimination of salt as well as liquid assists in lowering blood pressure. It helps in kidney and liver problems. *Nardostachys jatamansi* functions as an excellent sedative. It calms the animal and allows good sleep. It works by adjusting signals within the central nervous system. It is commonly called as 'Jatamashi'. *Leptadenia reticulata* is an excellent Spermatogenic as a result improves fertility in male animals. It is also a very effective Galactagogue as a result its appropriate usage in lactating cattle improves the milk yield as well as profits for the cattle rearers. It is locally recognized as 'Nepali jivanti'. *Sesamum*

indicum is called as 'Black Till' in local terms. It is very rich in anti-oxidants. It not just boosts the Immunity in the domestic animals and pets but makes them healthy over all. *Taraxacum officinale* also identified as 'Kanphool' is one of a good Hepatic stimulant. It is useful for curing liver disorders and jaundice. *Piper longum* boosts the digestion in young animals. It is a good appetizer and increases appetite in animals for their healthy weight gain. It posses the property of Anti-flatulence. It is very useful for pets that are sick and are recovering from the same. *Silybum marianum* is also a known hepatoprotectant which means it cares and protects liver specially meant for animals affected by jaundice and hepatitis. It also boosts the normal functioning of liver. *Glycyrrhiza glabra* locally called as 'Jethimadh'. It is mainly useful in treating respiratory system problems in animals. It is nothing but Liquorice root extracts and is useful for curing stomach problems in cattle and horses. It also offers relief in Arthritis in old pet animals. *Curcuma longa* is locally called as 'Haldi' and has wide usage in curing diseases and related problems of cattle and pet animals. It promotes healthy liver functioning. It keeps the digestive tract healthy by killing harmful germs and promoting its healthy functioning. It keeps the skin and eyes of pets healthy and glowing.It cures horse hoof abscesses and heals wounds completely. This anti-infective, anti-viral, and anti-inflammatory. *Cinnamomum zeylanicum* is an excellent Immunomodulator which is generally used as spice by humans serves for boosting immunity in animals. The chemicals present in this extract stimulate the production of antibodies in animals and thus protects them from diseases. It is called as 'Taj' or 'Dalchini' locally. *Moringa oleifera* is called as 'Sargava' commonly. It is also fed as fodder for cattle as it increases healthy weight gain in cattle and boosts their milk production. It proffers appropriate nourishment to the cattle. It has wound healing, anti-inflammatory and antipyretic capabilities.

SUMMARY AND CONCLUSION

The citation of few plants for the sake of supporting the case of use of plants and their phytochemicals is not adequate as the vastness of the spectrum of plants and their uses require immeasurable words to illustrate the immenseness of moot point. The acquaintance of man with use of plants is as old as the hills. It pioneered the elementary knowledge of animal medicine. But today scenario has changed

and emergence of modern sciences led to a downfall in the use of the traditional knowledge reservoirs. The indigenous knowledge of remedies regarding animal health is considered as old as domestication of various livestock species. Unfortunately, these practices, which are in vogue throughout rural India, are little documented and there is danger of extinction of this knowledge. Thus it has become imperative to collect and document these practices and to assess their validity. It is high time now to reinstate the old glory of plants in therapeutics field, which they enjoyed long ago and deserve even today.

Indigenous plant knowledge has immense potential for innovation, especially at the grassroot level. India being a developing country populated by a number of indigenous communities, most of which have their own set of unique traditional plant knowledge base and much of it is at par with the modern remedial system and provided the indigenous communities with comfort and self-sufficiency. Traditional knowledge of plants has played a significant role in the overall socio-economic development of the communities. A wide range of diverse sectors including agriculture, animal husbandry and fishing considered this knowledge as an imperative in Indian context. The ultimate ambition of animal healthcare is to alleviate the animal's pain and other bodily stresses inflicted on them due to production activities. There is a lack of proper alliance between the practice of indigenous and modern knowledge. An appropriate association between the traditional and modern knowledge has immense potential to benefit the society. The affordability of indigenous preparation and swift recuperative aspect of allopathy can instantly create a synergistic rapport between the two fields. So, the need of the hour is to promote such alliance as they are the future of an affordable and effective remedial system. Field of Animal husbandry, which has provided livelihood to countless family, exhibits a dire urgency of upliftment and by the unison of traditional and modern knowledge it can be achieved at a prompt speed. As words of Oliver Cromwell, an eminent British politician of his time emphasised correctly- '*Nature can do more than physicians'.*

Use of Plastics in Horticulture Production

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The use of plastics in horticulture has made considerable headway during the last decade. We are aware that plastics contribute from planting to post harvest handling and processing in many fruit crops. Plastic is used at each and every stage of horticultural life cycle right from seeds packaging, planting, propagation, mulching, irrigation, harvesting, fruit packing and preservation. The application of plastics in agriculture sector is popularly known as Plasticulture. India produces about 5 million tones of plastics annually and use about 0.35 million tones in agriculture. Plastics are used in greenhouses to promote growth and production, mulching to suppress weeds and maintain soil temperature and moisture as well as in containers for seedling and soil solarization to reduce pest and diseases.

Plastic is very useful because it can be colored, melted, shaped, squashed, cheapness, light weight, impermeable to moisture and gases, rolled into sheets or made into fibers. The unique advantages of plastic over conventional materials are higher strength/weight ratio, superior thermal insulation properties, excellent corrosion resistance, superior flexibility, resistance to most of the chemicals, excellent moisture barrier properties, favourable gas permeability, smooth surface resulting in reduction in friction losses, excellent light transmissibility, helps to enhance shelf-life of the produces, better visibility of the produce *etc*. The used of plastics in fruit production by various techniques are as follow.

MULCHING

A protective covering (as of plastic film,

sawdust, compost, grass, hay, dry leaves, or stones) spread or left on the ground to

reduce evaporation, maintain even soil temperature, prevent erosion, control crops, prevents weed growth, improves soil micro climate, conserves water,

weeds, enrich the soil, or keep fruit clean. These prevent the loss of moisture and acts as a barrier between the soil and atmosphere. It helps in moderating the soil temperature and micro-climate in the plant root zone, which helps to increase yield and early maturity of crops. In addition to this plastic mulch can maintain soil moisture and prevent weed growth around plant. Generally black plastic mulch film is used in fruit production but two sided coloured plastics mulch films such as yellow/black, white/black, red/black or silver/black also used in specific crops, which determine its energy radiating behaviour and also influence the micro climate around the plant. Plastic mulch film having different thickness and choose based on type and age of plant. It available from 7 to 100 micron thickness but for medium duration crop 25 to 50 micron and for long duration crop 50 to 100 micron thickness is suitable.

It has some other advantages like provides favourable soil moisture for development of roots and plants and ideal environment for earthworms and other soil micro-organisms beneficial for effective in dry land farming, increases crop yield and keeps the crop clean, improves quality of produce, prevents soil erosion and run off, reduces soil compaction due to heavy rains. Nowadays LDPE (Low Density Polyethylene) and LLDPE (Linear low-density polyethylene) plastic covers use in mulching. The thickness used for plastic mulch is 25 to 40 micron in fruit cultivation.

DRIP IRRIGATION

Precise and regulated application of irrigation water and plant nutrients at low pressure and frequent intervals

through drippers/emitters directly into the root zone of plant with the help of close network of pipes is known as drip irrigation system. The advantages of drip

irrigation are to improve quality, ensure early maturity of the crops, water saving up to 40% - 70%, controls weed growth, saving of fertilizer (30%) and labour cost (10%), fertigation /chemigation can be made efficiently, control diseases, use of saline water is possible, soil erosion is eliminated suitable for uneven/undulating land, high water use efficiency and increase in production and productivity of fruit crops.

The most important feature of plastics in drip irrigation system is the unit made by plastics are rust proof. The other quality like resistant to UV radiation, wide pressure compensation range, easy fitting of accessories, crack resistant and easy to roll back. This system is mostly made up of HDPE plastics. The sub lines and lateral lines having wide range of wall thickness from 0.5 to 2 mm.

SOIL SOLARISATION

Soil Solarisation is normally done during summer months when the air temperature more than 35°C. This is done by covering the moist soil with a transparent polyethylene film exposed to sunlight. Soil solarisation can prevent weeds growth, occurrence of bacteria, fungi, nematodes and other soil borne pathogens and pests, helps in reducing usage of weedicides/herbicides and pesticides. The effectiveness of soil solarisation enhances plant growth by improving soil colour, structure, temperature, moisture *etc*. Soil moisture, day length, temperature and intensity of sunlight are the factors effecting soil solarisation. Suggested polyethylene film for soil solarisation is 25 micron transparent polyethylene film.

PROTECTED CULTIVATION

Greenhouse is a framed structure covered with glass or plastics film (transparent and translucent) in which plants are grown under the partially or fully controlled environment. The greenhouse technology has been considerable importance in better space utilization, growing crops in extreme climatic conditions and high rainfall areas. The plastics film used in greenhouse act as selective radiation filters. The solar radiations pass through it and trap the thermal energy inside the greenhouse, which is emitted by the objects that are kept inside, this phenomena is known as "greenhouse effect". The properties of cladding material are UV stabilized, transparent to light, anti-fogging and anti-algae. Green house cultivation is very important because it can moderates temperature and humidity, increases yield, quality and

reduces crop duration, conserve moisture thus needs less irrigation, cultivation of off-season crops possible, helps to grow crops in different climatic conditions as it provide favourable condition to plant and to grow high value crops for export market. Moreover, it helps in raising early nurseries for different crops and also helps in hardening of tissue cultured plants and grafts. Shed net are used in

rising of nursery structure which is made up of polythene threads. To reduce light intensity different shed net are available such as 15 %, 35 %, 40 %, 50 % and 90 %. It is also available in different colours like green, white, black, blue or red and different colour combinations like green × black, black × black, green × green or white × green. It helps to control pests and diseases, manipulation of microclimate and insect proof feature and creates self-employment opportunities for educated youth.

PROPAGATION AND NURSERY

In the propagation plastics are generally used in layering and grafting.

In grafting polythene strips are used to tie stock and scion. Different colours of poly-wrappers used in layering. Red, blue and black poly-wrappers having higher success in rooting and survival by increasing physiological activities (etiolation effect) which is essential for cell division and cell enlargement. In nursery plastics are used in form of nursery bag, plug tray, crate and hanging basket. It is easy to handle, planting, transplant and transport. This plastic nursery bags can be used in different size and thickness depend on crop.

PACKAGING

Packaging is one of the most critical areas in the distribution and marketing of agricultural produce. More than 30% of agricultural produce is lost between the chain of farm and consumer. The packaging must stand up to long distance transportation, climate, storage condition, multiple handling during

distribution and marketing of agricultural produce. Traditional packaging techniques such as wooden crates and jute bags have many disadvantages like untreated wood can easily become contaminated with fungi and bacteria, material may be too hard or rough for produce like soft fruits, need of disposal of the crates after use so not reusable and ultimately cost of such material is more. Generally LDPE (Low Density Polyethylene), PVC (Polyvinyl Chloride),

PP (Polypropylene), LLDPE (Linear low-density polyethylene), HDPE (High Density Polyethylene) and PA (Polyamide) are used as plastic material in fruit packaging. Plastic packaging is very important because plastics are

flexible, light weight, cost effective, hygienic, transparent so product visible from outside, easy printable, reusable, increases shelf-life of the produce. It provides invaluable support during processing, used in making of different packaging materials like flexible plastic films, tray with over wrap, punnets, net bag, foam sleeve, crates and also used in storing, preserving and transporting of fresh as well as processed fruits.

SLEEVING

Sleeving technique involves a cylindrical plastic bag of 16-18 micron thickness having both end open and is useful for protection of banana bunch from wind, rain, hail, dust, pest *etc*. It applies at the stage when finger start curl upward. It protects the skin of the fruit against leaf insect and bird damage as the fruit matures. Due to sleeving fruit size is more uniform and larger throughout the bunch and also fruit gets better colour.

CONCLUSION

For qualitative and quantitative horticultural production, plastics can be used for various purpose *i.e.* mulching, cladding materials for protective structures, nets, pressurized irrigation, soil solarization, plastic traps, propagation, sleeving and packaging. By using plastics in fruit culture not only increase production but also minimize the pest, diseases and weed population and extend shelf life of fruits as well as saving fertilizers and water, minimize the use of herbicides and pesticides as compared to conventional methods.

Snake bite cases in Domestic Animals and their treatment: An Overview

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Abstract

The mortality due to snake bite in rural areas are more due to lack of penetration of emergency health services properly, treating the snake biting cases in a traditional way which are mostly inimical to the patient and aggravates the condition and sometimes the patients are brought to the dispensary at a final stage which makes it impossible to save the patient. In case of domestic animals, the snake bite cases many times goes unnoticed and comes into display in a terminal stage when it is not so successful to give a lifesaving treatment to the ailing animal and the patient loses its life. And there are also incidents where albeit the biting cases are noticed earlier, the animal may die due to the lack of proper treatment which requires on a war foot. A detailed method to identify the venomous and non-venomous snakes, their toxins and how they work along with the diagnosis and treatment of snake bite cases are discussed in this communication.

INTRODUCTION

The mortality due to snake bite is a great concern especially for tropical countries albeit the snakes are inhabitant in all over the world except in some countries like Antarctica and Iceland. They embrace the habitats like water, land, deserts and prairies and some snakes are predominantly found in specific areas like common brown snakes in deserts and green tree python encountered in tropical rain forests. India, a country which has vast geographic extensions and a wide range of landscapes, the death due to snake bite is staggeringly high which accounts for nearly 1300 to 15000 (Fig 1) in humans (Mohapatra et al., 2011), owing to the lack of emergency health services and awareness among the rural areas. However, in animal husbandry sector a detailed survey is lacking regarding the mortality of the animals due to the snake bite. There are nearly 3500 different species of snakes. Among those only 400 are venomous. In India around 272 species of snakes are present, out of which about 60 species are highly venomous. Snakes are protective in nature and they go for a fatal strike in self- defence when they are threatened or in apprehension of imminent danger. Grazing animals especially in swampy areas and area where snakes are

generally found are prone to snake bite. In case of dogs and cats, as they show curiosity towards moving object, harass the snake and get bitten as a result of.

TYPES OF SNAKE

Snakes are widely divided into two categories i.e. Venomous snakes (capable of producing and injecting snake venom through specialized teeth called fangs, see fig 2) and non-venomous snakes (lack the venom but make for it with sheer muscular power that they use to subdue and kill their prey). In venomous group there are 6 families which are: Colubridae (eg. Boomslang, Vine snake, Keelback snake, California kingsnake**,** Corn Snake, Black Rat Snake etc); Elapidae (eg. Cobra , King Cobra , Krait , Mamba , Taipan , Coral snake , Australian snakes etc.); Hydrophidae(all sea snakes) ; Viperidae (all vipers) ; Crotalidae (pit viper, Rattle snake etc.) ; Laticaudidae (Sea kraits).

IDENTIFICATION OF SNAKES

Most of the snakes are non-venomous. Identification of venomous or non-venomous snakes is important because sometimes the bite of a non-venomous snake may lead to death out of fear. The venomous snakes possess certain morphological characteristics by which it is possible to distinguish them from non-venomous snakes.

General symptoms:

1) General: Nausea, vomition, abdominal pain, weakness, drowsiness, prostration.

2) Cardiovascular (viperidae): visual disturbances, dizziness, collapse, shock, hypertension, cardiac arrhythmias, pulmonary oedema etc.

3) Bleeding & clotting disorder (Viperidae): Traumatic bleeding from recent wounds & from old partly healed wounds.

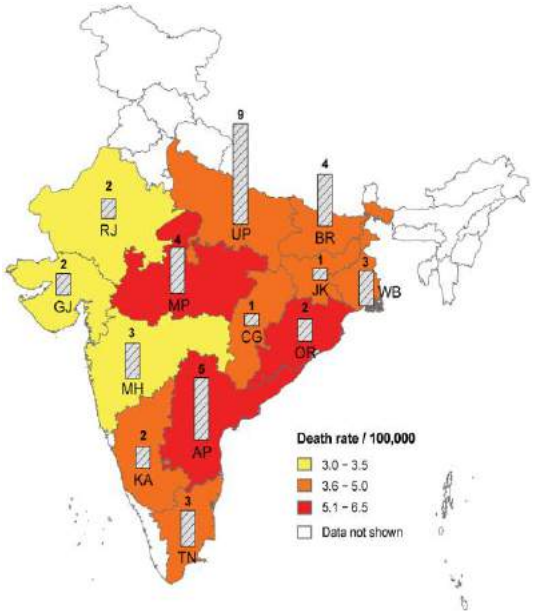


Figure 1: Annual mortality rate due to snake bite in different states in India.

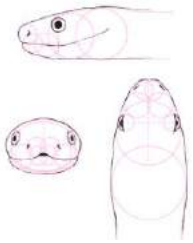
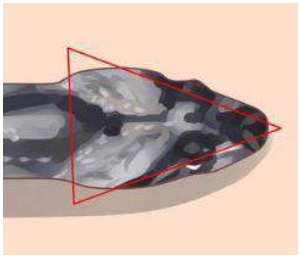
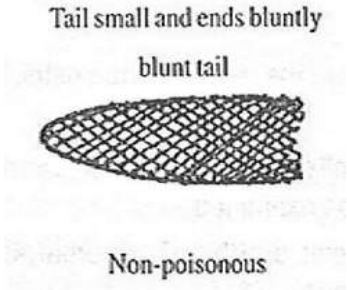
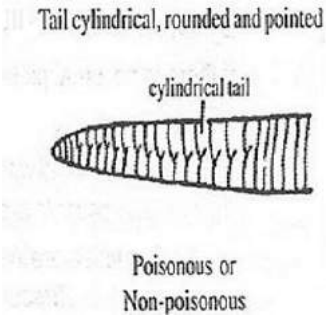
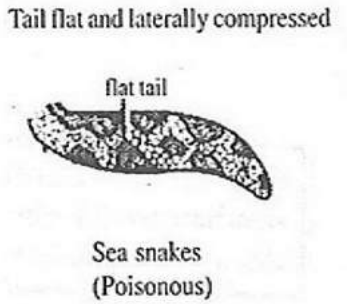
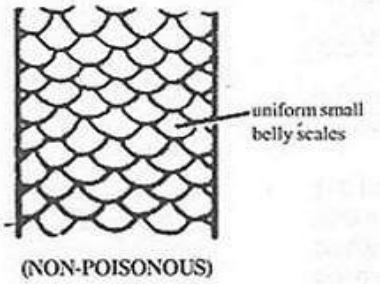
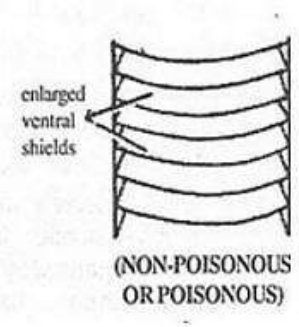
4) Spontaneous systemic bleeding: From gums, epistaxis, intra cranial hemorrhage, rectal bleeding, haematuria, vaginal bleeding.

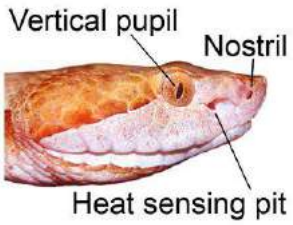
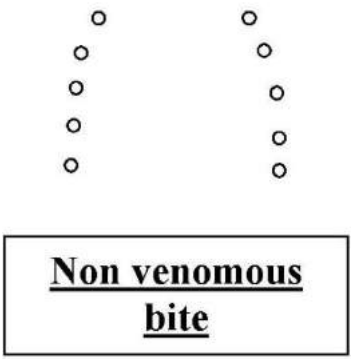
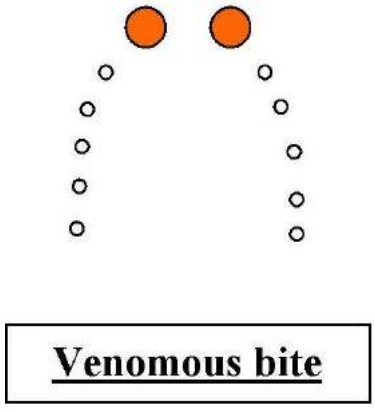
5) Neurological (Elapridae): Drowsiness , paralysis of facial muscle, aphonia ,regurgitation through nose, difficulty in swallowing & respiratory paralysis.

Different test to know snake bite:

Treatment:

In primitive ages, to minimise the spread of snake venom people use tourniquet i.e. stop the flow of blood through blood vessels with a tight bandage. But gradually as science developed it was proved by many research findings that this process is not helpful to either animals or human beings. Application of tourniquet results in accumulation of snake venom on that particular part of the body.

Characteristics	Non-venomous Snakes	Venomous Snakes
Shape of Head	Head is usually narrow and elongated 	Head is usually triangular 
The Nature Of The Tail	• If the tail is round or cylindrical and pointed, it may be venomous or non-venomous  • 	• Tail of a snake is flat, laterally compressed and oar-shaped (adaptation to swimming in water), it is a sea snake • If the tail ends bluntly, it is non-venomous  •
The Nature of The Ventrals	• Ventrals are small and narrow • Snakes like Python, the ventrals are fairly broaa, but do not extend compieiely across the belly. On either side of ventrais, small scales are present.  •	• Ventrals are broad extending completely across the belly, it may be venomous or a non-venomous snake. • 

Hood	• Mostly hood is absent. • 	• All hooded snakes are poisonous except sea snakes. 
Pupil	• Pupils are circular. 	• During the daytime, pupils look like slits. 
Heat sensing pit	• Often do not have a heat sensing pit on the head	• Have a heat sensing pit on the head • 
Nature of Snake Bite	• When a non-venomous snake bites, many punctures are usually made on the skin by the maxillary teeth of upper jaw. 	• When a venomous snake bites, there will be 1 or 2 punctures on the skin of the victim (the punctures are made by fangs). 

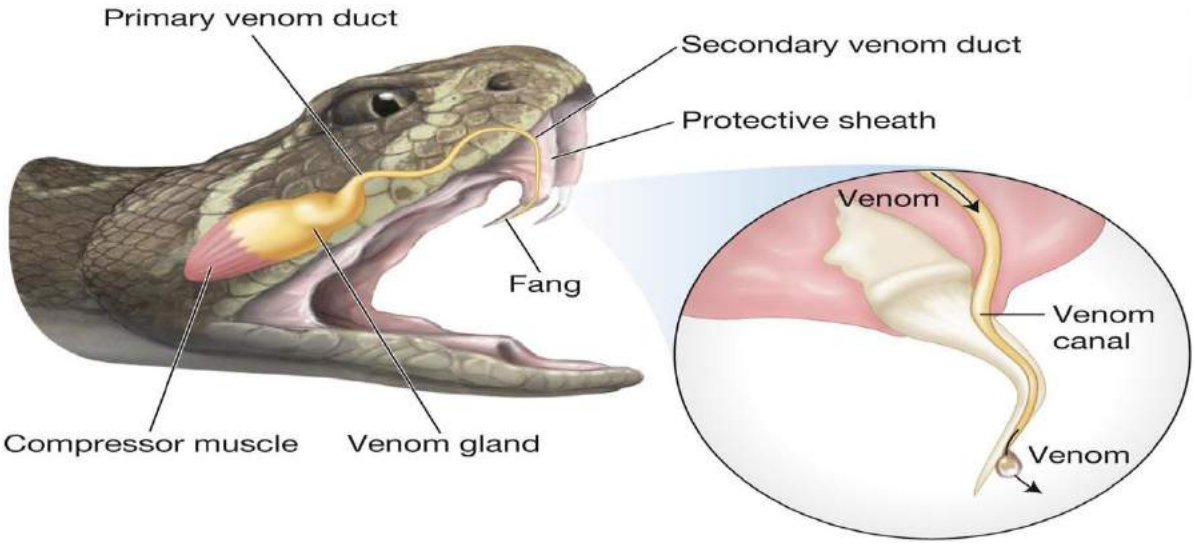


Fig 2: Anatomy of fangs.

Most of the snake venom contains cyto-toxic principles like proteolytic toxin, myolytic toxin etc. and accumulation of such cyto-toxins results in cell necrosis which in sever complication may result amputation. Similarly, sometimes people also follow the process of suction but by this process more area of blood vessels and nerve gets exposed which hastens the flow of toxins inside the blood vessels. Once a snake bites, people present around starts screaming and howling which makes the victim more frightened. This increases the heart rate which in turn hastens the flow of toxins to the heart.

Despite exercising all this it's advisable to clean the area of snake bite by proper washing so that some venom may wash out. Either animal or human, try to keep the patient calm and immediately they should be taken to nearby hospital to get better results.

Following treatment procedure is follows for snake bite patient

1) Anti-snake venom: Two types of anti-snake venom are commercially available i.e. monovalent and polyvalent.
   - If the snake type is known then generally go for monovalent (contains anti venom of only one snake)
   - If the snake type is unknown (mostly found) then go for polyvalent anti snake venom.

N.B:

Polyvalent anti snake venom contains followings

Cobra	0.6 mg
Common-Krait	0.45 mg
Russell's Viper	0.6 mg
Saw scaled Viper	0.45 mg

Anti-snake venom is given 1 dose (10 ml/ vial) with NS (100 ml) intravenously.

If required a 2nd dose is generally given after 12 hrs, if the symptoms are not decreases.

2) Anti-Tetanus Serum (ATS) :

Due to snake bite there may be a chance of entry of tetanus organism (*cl. tetany*) which generally causes Tetanus. To get rid of this problem 1 dose intra muscular injection ATS is given.

3) Anti-Histaminic :

To get rid of the histamine production after snake bite or to check the histamine production due to anti snake venom it is generally advised to give anti histaminic preparation like pheniramine maleate (AVIL) or corticosteroids.

4) Antibiotics:

To prevent secondary bacterial infection we have to give anti biotics to the patient.

Reactions during anti snake venom therapy and its managements:

More than 10% of the patient usually suffer some adverse reaction during or following anti snake venom therapy. Sometimes these reactions are fatal if not treated properly.

Early anaphylactic reaction: This usually develops 10-180 minutes of starting anti venom. Animal begins to and develops utricaria, dry cough, fever vomition, nausea, abdominal pain, diarrhoea and increased heartbeat. A few patients may develop severe life threatening reaction like anaphylaxix: hypotension, bronchospasm and angio-oedema.

Pyogenic reaction: Usually develop 1-2 hrs after treatment. Symptoms include tremor, fever, and fall in blood pressure due to vaso-dilation.

Late Serum sickness: It usually develops 1-12 days after treatment. Clinical signs include fever, nausea, vomition, diarrhoea, itching, urticaria, myalgia, lymphadenopathy, swelling over eye region, nephritis with protein urea and rarely encephalitis.

For early anaphylactic aeration and pyogenic reaction epinephrine (adrenaline) is given 0.01mg/kg body weight intra muscularly. After epinephrine, an anti-histamine H_1blocker such as chlorphenamine maleate @ 0.2mg/ kg bodyweight intra venously followed by intravenous corticosteroid @2mg/ kg bodyweight may be given.

For treatment of late serum sickness reaction, a 5 day course of oral antihistaminic preparation results complete recovery. If not treated then a 5 day course of prednisolone may be given.

CONCLUSION

There is an urgent need to check the highly valuable human and animal lives which fall due to snake bite by addressing the common loopholes like securing emergency services in the rural areas and more importantly, public awareness in areas like what to do and what not to do in snake bite cases. It is also important to discourage people from superstitious methods to deal with snake bite cases which can be achieved through public awareness programmes. In a nutshell it can be concluded that a comprehensive policy towards snake bite cases starting from hygiene and sanitation to public awareness is inevitable to battle the said problem.

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Table 1: **The various constituents of snake venom and their actions in the body**

Constituents	Mechanism of action	Effects
Pro coagulant enzymes	Stimulate blood clotting with the formation of fibrin in the blood stream	Results in incoagulable blood because the fibrin clot is immediately broken down by the body's plasmin fibrinolytic system and within 30 minutes of bite the level of clotting factor are so depleted that the blood will not clot.
Zinc metallo proteases	Damages vascular endothelium	Internal bleeding
Cytotoxic/ necrotic (proteolytic & phospholipase)	Produces pre-synaptic neurotoxin activity which results to auto pharmacological release of histamine and anti-coagulation.	Damages mitochondria, RBC, platelets, peripheral nerve endings, skeletal muscles, vascular endothelium
Haemolytic toxins	It destroys the RBC and other blood components	Intravascular Haemolysis
Myolytic toxins	This involves a non-enzymatic mechanism that leads to severe muscle necrosis	Necrosis of the muscles, paralysis and death due to paralysis of the diaphragmatic muscle.
Neurotoxins (Pre synaptic and post synaptic)	They bind to acetylcholine receptors at motor end plate. Presynaptic neurotoxins (β- bungarotoxin , crotoxin and taipoxin) consists of 120 - 140 amino acidsand a phospholipase A sub unit	They release acetylcholine at the nerve ending and damage the endings which prevents further release of transmitter

Table 2: Different tests to determine the snake bite case

Test	Procedure	Interference
20 min whole blood clotting test (20WBCT)	Place 2 ml of freshly sampled venous blood in a clean glass test tube. Leave it 20 min undisturbed in room temp	If the blood is clotted then –ve or normal & if un clotted it is +ve.
Platelet count	Whole blood is diluted with 1% ammonium oxalate solution. Incubate for few minutes. Following the incubation, the dilution is mounted on a haemocytometer. The cells are allowed to settle and are counted under the microscope.	The platelet count generally decreases in viperidae & elapridae.
Total Leukocyte Count	It is estimated using WBC pipette, WBC diluting fluid and Haemocytometer with the help of microscope.	Early neutrophilic leukocytosis is found
Blood film	Place few drops of blood over a clean glass slide and make a film over it. Fix it with ethanol and stain it. Then observe under microscope.	Fragmented RBC are seen
Plasma/serum	Collect the whole blood and place it on room temperature for 30 min to 1 hour and centrifuge it to get serum. Or Collect the whole blood in a container containing anticoagulant and centrifuge it @2000 rpm for 20 min.	Pinkish or brownish due to haemoglobinaemia and myoglobinaemia
Desaturation	It can be done by use of pulse -oximetry	Arterial oxygen saturation can be assessed non- invasively in patients with respiratory failure or shock using oximeter

Clean Milk Production Practices for Dairy Farmers

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Milk is good medium for growth of micro-organisms. The purpose of milking a dairy animal is to obtain milk that is fit for human consumption. Milk from udder of a healthy cow contains very few bacteria and to keep it safe for long it should be handled hygienically. Unclean milk may be: a source of disease; rejected at the market; not good for processing and thus is a loss to farmer. The milking procedure is the first step in obtaining clean milk. Milking is an art requiring experience and skill. Milking should be conducted gently and quietly because frightening has a negative effect on milk let down due to release of adrenaline (hormone). Cows remaining comfortable yield more milk than a roughly handled cow. The act of milking should be finished within 5 to 7 minutes, so that udder can be emptied completely so long as the effect of oxytocin is available. Milking can be done either with hand or by machine.

STEPS FOR CLEAN MILK PRODUCTION

Equipment:

- Use aluminum or stainless steel cans for milking and storing milk.
- Clean utensils immediately after milking or after emptying milk: rinse with cold Water, scrub with a brush using hot water with detergent then rinse with cold water.
- Place upside down and dry in the sun and then store in clean and ventilated room.

THE MILKING ANIMAL

Animal should be fed with balanced ration. Feeding very high amounts of concentrates and low amounts of forages result in milk with low butter fat. On the other hand feeding too little concentrates leads to low milk yield. Animal should be kept healthy and clean as sick animals can transmit diseases like tuberculosis and brucellosis to milk consumers. Milk from antibiotic treated animals should not be used until withdrawal period is over. Mastitis can be controlled by observing general hygiene and proper milking procedure.

MILKING PARLOR

- A milking should be located away from any smells.
- Floor should be clean and dry; cement floor preferred for easy cleaning.
- Cleanliness results in better udder health and production of milk that remains wholesome for longer time.

- Parlor should be cleaned after each milking with clean water.

Milker:

- Should be healthy and clean.
- Milk the animal quickly and completely without interruptions.
- Maintain short nails and hair and never smoke during milking time.

Animal handling and preparation:

- Offer feed to the animal according to its production level.
- Tie hind legs above hock joint in loose knot (applicable only for hand milking).
- Pre-milking sanitation can be done by dipping teats with sanitizer (0.5 % iodine).
- Wash hands with soap and clean water before milking and dry hands with towel.
- Test for mastitis with strip-cup method. If mastitis found, animal should be milked last.
- Wash udder with warm clean water with disinfectant using a clean towel. Warm water also stimulates milk let down. Dry the udder using a dry towel.
- Apply milking jelly - prevents cracking of teats and eases milking.
- Milk quickly and completely in clean container by squeezing teats, do not pull.
- After milking: Strip the teats to avoid incomplete milking (can lead to mastitis).
- After milking, dip the teats in a teat dip.

Actual Milking

For hand milking, full hand method is the best as it is most kind to the teats. After milking, teat has to be dipped into a bactericide solution to minimize risk of infection. The practice of dipping of fingers into the milk and then wetting the teats to soften them is not recommended. Care has to be taken that animals are not allowed to sit soon after milking, because the teat canal remains open for some time.

CLEANING OF MILK EQUIPMENT

Milk cans

- Rinse the cans with cold water, scrub with brush and detergent. Again rinse with cold water and sterilize with boiling water or sanitizing solution e.g. hypochlorite.
- Dry cans on a drying rack. Exposure to sunlight will enhance killing of bacteria.

Milking machines and milk transportation equipments

- Use the "cleaning-in-place" (CIP) method where detergent in hot water is circulated in the system. Then rinsed with hot water again.
- Timely replacement of worn out rubber parts should be undertaken regularly.
- Transportation requires insulated bulk tankers which require special additional equipment like pumps which should also be thoroughly cleaned. Select detergents that will not corrode the equipment material.

MILK STORAGE

Store the milk in a lockable, cool and clean place. Do not mix warm (morning) milk with cool (evening) milk; deliver to the collection centre separately or cool the warm milk before mixing. Milk is highly perishable hence it should be

preserved to ensure its safety for human consumption. Milk can be preserved by cooling or heating. Chemicals can also be used to preserve milk but only on advice from the collecting centre because it is important to use the correct type and amounts. Nevertheless, if used correctly, chemicals have little effect on the physical quality of the milk.

Inulins- A Potential Dietary Fibres For Human Health

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Abstract

Inulins are a group of naturally occurring polysaccharides produced by many types of plants, industrially most often it is extracted from Chicory plant. The inulins belong to a class of dietary fibers known as fructans. It contains high in fiber and contributes low calories in diets. It has other health benefits like anticarcinogenic effect, weight loss, calorie reduction and many more. Apart from health effect it is used as fat replacer, sugar replacer as well as emulsifier, thickener, prebiotic and stabilizer in various food products.

Key words: Inulin, dietary fibers, fructans, anticarcinogenic effect, prebiotic

Inulin

"Dietary fiber is the edible part of plants and analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the human large intestine. It includes polysaccharides, oligosaccharides, lignin and associated plant substances. Dietary fiber exhibits one or more of either laxation (fecal bulking and softening; increased frequency; and/or regularity), blood cholesterol attenuation, and/or blood glucose attenuation.

Inulin is a soluble dietary fibre. It is a naturally occurring oligosaccharide (several simple sugars linked together) belonging to a group of carbohydrates known as fructans. Like most carbohydrates, inulin is non-digestible. This allows it to pass through the small intestine and ferment in the large intestine.

Sources of Inulin

Inulin is a non-structural, storage carbohydrate, found in leeks, onions, wheat, asparagus (*Asparagus officianalis*) garlic, Jerusalem artichoke (*Helianthus tuberosus*) and chicory (*Cichorium intybus*) root.

Chemical structure of Inulin

Chemically, inulin consists of a long chain made up of fructose molecules and one glucose molecule at one end. The fructose molecules are connected by β-(2-1) bonds and the last fructose is linked with a glucose by α-(1-2) bond (Kim et al., 2001).

Health benefit of Inulin-

Inulin as a dietary fiber

Due to the presence of β-(2-1) configuration of the fructosyl-fructose linkages, inulin type fructans remain non

digestible in the upper gastrointestinal tract. In the colon they are selectively fermented by the colonic microflora like Bifidobacterium to produce short chain fatty acids (SCFs) and gases such as hydrogen, methane, carbon dioxide etc. Inulin in addition to proliferation of bifidobacteria, decreases faecal number of bacteriocides and clostridia significantly.

Calorie Reduction

Inulin has much lower caloric values than typical carbohydrates due to the presence of β-(2-1) bonds which prevents it from being digested. Inulin passes to the large intestine intact and are fermented by the colonic bacteria. The short chain fatty acids and lactate that are produced during fermentation are metabolized and contribute only 1.5 kcal/g (6.3 kJ/g) of energy (Roberfroid, 1999).

Good Digestive Health

Inulin has been observed to relieve constipation (Den Hond et al., 2000), reduce faecal pH, control proliferation and inflammation of intestinal mucosa (Delzenne et al., 2002), treat ulcerative colitis and inhibit *Clostridium difficile* infections (Paul, 1996) through the release of bacterial end products like short chain fatty acids such as acetate, propionate, butyrate, lactate etc. (Delzenne et al., 2002) on fermentation.

Hypocholesterolemic effect

From experimental studies it was observed that inulin had hypocholesterolemic effect. (Kim and Shin, 1998). It was also reported that inulin had triglyceride lowering effect in human body by generating short chain fatty acids that inhibit hepatic fatty acid synthesis in liver through inhibition of all lipogenic enzymes in animals (Delzenne and Kok, 1999)

Anticarcinogenic effect

Colon cancer is one major cause of cancer morbidity and mortality among people. Aberent crypt foci (ACF) are putative precursor lesions from which adenomas and carcinomas may develop in colon. It was reported that diet containing 10% inulin significantly reduced aberrant crypt foci (ACF) (Reddy et al., 1997). Wang and Gibson (1993) proposed that the change in composition of microflora in the gut by inulin may be related to inhibition of preneoplastic lesions. Inulin is also helpful in preventing the risk of breast cancer. Supplementing diet with inulin can significantly reduce the risk of breast cancer by inhibiting the tumors growth (Taper and Roberfroid, 1999).

Effect of inulin on mineral absorption

Some studies have suggested that chicory inulin as a soluble fibre may increase the absorption of calcium in body , improve bone mineral density, and reduce the risk of osteoporosis development (Miremadi and Shah, 2012). Kaur and Gupta (2002) elaborated the effect of inulin on calcium absorption mechanisms, these author described that calcium absorption could be due to its increased availability by transfer of calcium from the small intestine into large intestine and the osmotic effect of inulin that transfers water into the large intestine, thus allowing it to become more soluble .

Applications of inulin in food-

Inulin is colourless, neutral in taste and has minimal influence on the sensorial attributes of a product. Furthermore, inulin is known to significantly improve organoleptic characteristics of the products (Franck, 2002). Inulin also act

as fat replacer, sugar replacer as well as emulsifier, thickener and stabilizer in various food (Miremadi and Shah, 2012).

Prebiotic Effect

Inulin acts as prebiotic. "In various *in vitro* and *in vivo* studies it was noticed that a diet supplemented with inulin helped in stimulating the growth of beneficial bacteria (e.g. *Bifidobacteria*) in the colon as well as inhibiting the growth of pathogenic microorganisms (Roberfroid *et al*., 1999). It was reported that, inulin had the bifidogenic effect even at low doses (5g/d) (Delzenne et al., 2002).

Dose of inulin

There are three categories of people regarding the sensitivity to fermentable carbohydrates. They are 1.nonsensitive persons can consume 30 g/d or more of the compound almost without undesirable reactions; 2. sensitive persons can consume 10 g/d of the compound without undesirable reactions but might experience undesirable reactions with doses of ≥20 g/d; 3.very sensitive persons *can* already experience undesirable reactions at doses of ≤10 g/d (Coussement, 1999).

Future research prospect on Inulin

A large number of researches have focused on the production and bifidogenic effects of inulin in foods. Future research is required to focus on the combination of prebiotics and probiotics in development of new food products on and the task for assessment of the viability of commercial probiotic cultures in the presence of these prebiotic compounds like Inulin (Miremadi and Shah, 2012).

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Demonetization: A Tension or Benison for Farmers?

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The green fields are now a dark soil, kharif crop is harvested and Rabi sowing is going on. Ironically, climate was known to be a single known gambler with farmers and now demonetization is another player. Climate is a benison as well as a tension to farmers, now the time is to assess the same with demonetization. Demonetization is the act of stripping a currency unit of its status as legal tender. Demonetization is necessary whenever there is a change of national currency. The old unit of currency must be retired and replaced with a new currency unit. Demonetization was perceived as a weapon to curb black money and curb the non-tax payers. With the sudden withdrawal of legal tender of higher denomination of Indian currency, created a dynamics of change in the citizens. Farmers who have twin wing role, as a general public and as a feeding hand have to face a lot. Is demonetization a tensionorbenison to farmer?is the crux. Change is nature's law and should be welcomed. Change should be gradual and lead to dynamic equilibrium. Whereas, the demonetization has created disequilibrium which occurs when the rate of change is too rapid to permit the system to adjust.

DEMONETIZATION: A TENSION

Farmers represents the majority of rural mass, 90.00 per cent of them are digitally illiterate. Though today most of the farmers hold *Jandhan* account their utilization is virtual. Rural mass is mainly dependent on cooperatives for their banking activities, which are neither allowed to exchange nor dispense liquid money. Use of Automated teller machine (ATM) is suggested, but rural areas lack ATM booths. Farmers have to visit taluka places or district headquarters to use ATM. Liquid money with farmers is transient. They are paid after the sale of the crops; most of the farmer's payments for kharif yieldwere in old 500 and 1000 note denominations.

With aforementioned constraints the demonetization has impacted farming and farmers in the following ways; timely purchase of the core inputs like seed and fertilizer was not possible which lead to delayed sowing. Only seed is allowed to purchase by old notes. Newspaper reported that retailers refused to take old

notes as they have not issued any legal notice. Though the Government and Agricultural ministry claim that Rabi sowing has increased over last year, just by mere covering the area do not ensure higher yields. Seed need nourishment and management. Purchase of fertilizer is excluded by old notes. Various agricultural operations such as sowing, spraying, weeding etc., are critical for successful establishment of crop; demand both labour and input, farmers have no liquid money to purchase inputs and make wage payment. Research acknowledges that delayed sowing may lead to 19.7 percent reduction in wheat yield and 28.00 percent in Lentil. Changes in sowing dates may coincide with insect pest active feeding time and diseases attack. Farmers follow right input, right quantity and quality at right time for action against pest and diseases, time component is crucial, delayed spraying leads to ineffective management which in turn decline yield and increase cost of cultivation. Vegetable farmers are forced to sale their perishable produce at lower rates. Dairy farmers face problem such as no cash to purchase fodder, transportation of milk is in hit, vaccination of dairy animals will be adversely affected. Farmers are compelled to seek informal financial sources for credit which eventually may lead to distressed sales of their Rabi crop. The old debt, kind and wage payments get delayed and the interest on both formal and informal credit become a burden.

CONTINGENT ARRANGEMENTS TO COMBAT DEMONETIZATION TENSION

The impact is acting, under such conditionto counter action need twin action from farmers and government.Farmers can make following arrangements and take advantages of the same;

i) Collective procurement of inputs by contract farming.
ii) Ask retail input seller to provide inputs on mortgage of chattel.
iii) Utilize family labour instead of hired labour.
iv) Collective marketing of perishable products such as vegetables and milk etc.
v) Costand resource sharing among the fellow farmers.
vi) Dairy farmers can go for grazing of their livestock instead of stall feeding wherever possible.

On the part of the government apart from current arrangements and provisions, some arrangements such as

i) 100.00 percent subsidy for critical inputs such as seeds and fertilizer for Rabi crop can be made.
ii) Primary Agricultural Cooperative Societies (PACS) should be given banking powers to dispense liquid money only to farmers.
iii) MGNREG funds can be utilized to make wage payments of labour used by small and marginal farmers.
iv) Non-Agricultural sector companies can be asked to aid farmers in making contact farming, marketing and donating inputs as a part of Corporate Social Responsibility.
v) Market –led extension activities and innovation brokerage on the part of agricultural extension system can bring evasion of tension.

DEMONETIZATION: A BENISON

If we see the another surface of Demonetization it has just given a sense of feeling that the black, baron rich and ezxploiting middle men are under distress, other than thisfeelimg at present farmers have no benefits of this radical change. But, it has implications such as inclusion of farmers in formal banking, make them digitally literate, shift from cash to cashless agricultural transactions, due to higher deposits in public sector banks interest rates may be reduced and more agricultural loan may be dispense to farmers. Farmer may go for collective farming and contract farming and e-marketing. To round up from above discussion, at present the whole society is in transition state of change process, it have to be ready for the dynamics of change the demonetization have triggered. Ongoing tension may be soon transformed into a benison in coming days.

Rice bean: A Underutilized Legume

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Pulses along with cereals complete the diet of human beings. As compared to any other country pulses are very important in Indian agriculture. As most of the pulses are originated in India and became integral part of Indian agriculture. Among them Rice bean is one of the most important pulse, botanically known as ***Vigna umbellata*.** Unlike any other pulse it is little known, little researched and little exploited hence, comes in category of underutilized pulse crop. But with increasing demand for nutritional security rice bean recently gained attention as highly nutritive pulse with sound productivity. It belongs to Fabaceae family with diploid chromosome number 22. The centre of domestication is Indo-China. Progenitor of rice bean is *V. umbellate* var *gracilis*. It is short-lived warm-season annual pulse, mostly grown as an intercrop, of maize, sorghum and cowpea as well as a sole crop in the uplands. Grows well on any type of soil, establishes rapidly and has the potential to produce large amounts of nutritious animal fodder and high quality grain. It is used as dried pulse, vegetable, animal fodder and as green manure.

NUTRITIONAL ASPECTS OF RICE BEAN

Nutrient content of rice bean change it category from underutilised pulse to potential crop for nutritional security. The nutritional quality of rice bean is higher as compared to many other legumes of Vigna family. Rice bean occupy an important place in human, animal nutrition and soil health improvement. Along with protein it contains essential amino acids, essential fatty acids, vitamins and minerals. Thus it acts as supplementary to the cereal based diet by enhancing their protein nutritive value.

Human nutrition

In South Asia large population groups are predominantly vegetarians, some by cultural choice, but to most people the reason is economic. They cannot afford meat frequently. Therefore, pulses are crucial for fulfil their protein requirements. To fulfil a man's daily protein requirements the daily protein intake should match the daily protein metabolism.

Table 1: The composition of dried rice bean seeds per 100 g edible portion

Water	13.3 g
Energy	1369 kJ (327 kcal)
Protein	20.9 g
Fat	0.9 g
Carbohydrate	60.7 g
Fibre	4.8 g
Ca	200 mg
P	390 mg
Fe	10.9 mg
Thiamin	0.49 mg
Riboflavin	0.21 mg
Niacin	2.4 mg

The DRI (Dietary Reference Intake) is 0.8 grams of protein per kilogram of body weight. This amounts to 56 grams per day for the average sedentary man, 46 grams per day for the average sedentary woman. Dietary proteins should supply the eight essential amino acids (EAA) in proper proportions and in adequate quantities to synthesize tissue proteins in the body. To fulfil this requirement grain legumes and pulses plays very crucial role. Cereal proteins are deficient in lysine and legume proteins contain low amounts of methionine. However, when both cereal and pulses (legumes) are present in the diet in proper proportions, the proteins from these two sources supplement each other and make good each other's deficiencies in lysine or methionine to a significant extent.

Lysine content Scores based on FAO/WHO/UNU 1985 and 2007 Consultation patterns

Protein content of Rice bean varies between varieties but is commonly around 20%. The quality and quantity of essential amino acids present in rice bean is very favourable for human consumption. High digestibility makes it well suited for children, women and elderly with a weak digestion. It becomes pulse of choice because of its low fat content and relatively high proportion of healthy, unsaturated fatty acids.

Protein Source	Lysine Content (mg/g protein)
Wheat	27
Rice	35
Sorghum	24
Millet	22
Nuts / Seeds	35
Vegetables	43
Legumes	73

Phytate is an antinutrients which reduces micronutrient uptake, invariably present in every pulse crop. But low amount of phytate is important in human nutrition, here rice bean comes in to

picture as it contain very low amount of phytate as compared to any other pulses. In the ranking of content of known flatulence-producing oligosaccharides rice bean comes last. Ranking of flatulence-producing legumes is as: Hyacinth bean> Lima bean> Sword

bean> Rice bean. With sprouting and pressure cooking it get reduced and made rice bean as package of good nutrients. Enzyme inhibitors and antinutritive factors is part of most legumes, but the content of such substances appears to be low in Rice bean.

PREPARATIONS OF RICE BEAN

All parts of the rice bean plant are edible and used in culinary preparations. The dry seeds can be boiled and eaten with rice or they can replace rice in stews or soups. In Madagascar, they are ground to make a nutritive flour included in the food for children. Unlike other pulses, rice beans are not easily processed into dhal, due to their fibrous mucilage that prevents hulling and separation of the cotyledons. Young pods, leaves and sprouted seeds are boiled and eaten as vegetables. Young pods are sometimes eaten raw

ANIMAL NUTRITION

Rice bean is useful for livestock feeding. The vegetative parts can be fed fresh or made into hay and the seeds are used as fodder. Rice bean straw, the crop residue of the seed harvest, in dudes the stems, leafy portions, empty pods, and some seeds can be used as fodder to animal. In the marginal hills of Nepal, farmers consider rice bean both as a grain and fodder legume and look for dual-purpose landraces Rice bean is valuable as a high class fodder which is known to increase milk production in livestock.

SOIL HEALTH IMPROVEMENT

Rice bean is Nitrogen-fixing legume that improves the Nitrogen status of the soil, thus providing N to the following crop. is important as green manure for supply of nitrogen and replenishing the nutrient balance to make soil healthy. Its taproot has a beneficial effect on soil structure and, when ploughed in, returns organic matter and N to the soil. It produces high biomass in a very short period of time, can be easily incorporate into the soil, and decomposes rapidly all this characteristics made It also by providing good soil cover. After harvesting its seed, the dry plant can be utilized for soil cover for the dry season, resulted in reduction in soil erosion. Rice bean is considered as best legume for green manure.

POTENTIAL FOR RESEARCH

So far very little work has been done to exploit Rice bean's potential. For wide adoption there are several features which need to be addressed by breeders. High photoperiod sensitivity is one of the most important, as most varieties are photoperiod sensitive so when grown in the subtropics show late flowering and strong vegetative growth. Very suitable for use as intercrops because of twining habit which can provide support to other crops but also makes them difficult to harvest. Shattering is another feature which need urgent attention of breeder. Most of the varieties show high levels of hard seededness. To address all this issue there is need of genetic resources.

GENETIC RESOURCES

Institute of Crop Germplasm Resources (CAAS), Beijing, China; conserved as many as 1363 accessions. In India National Bureau of Plant Genetic Resources (NBPGR), New Delhi is nodal institute which conserves 902 accessions. To make wider adoption, more germplasm collection and characterization activities are required.

Organic Farming: Need for Green Environment

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Abstract

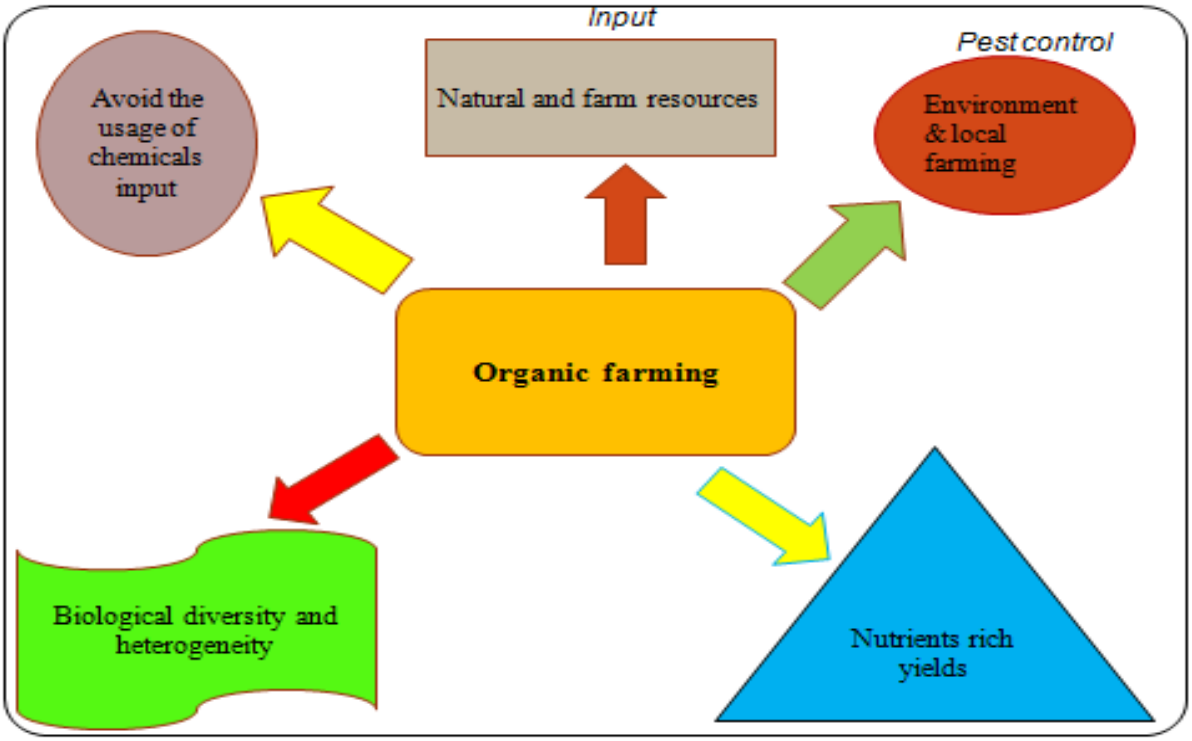
Organic farming is the sole alternative to sustain soil health and control environmental (soil, water and air) pollution in the present era. The success of organic farming depends upon right choice of inputs including organic manures, green manures, biofertilizers and other botanicals following the proper management practices. Despite some constraints, organic farming is useful for producing quality crops devoid of toxic chemicals and heavy metals.

INTRODUCTION

Since 1990 the market for organic food and other area (37.5 million hectares) and products has grown rapidly (63 billion) worldwide in 2012. Organic agriculture is a production system which avoids or largely excludes the use of synthetic compound. Organic farming is one of several "alternative" farming methods which developed mostly in reaction to the modern large-scale farming. Organic farming is also a comprehensive management approach to improve the health of underlying productivity of the soil.

MAJOR OBJECTIVES OF ORGANIC FARMING

- To produce food of high quality in sufficient quantity.
- To develop valuable and sustainable ecosystem.
- To maintain and increase long term fertility of soils.
- To promote the healthy use, as far as possible, renewable resources in locally organized production systems.
- To create a harmonious balance between crop production and animal husbandry.
- To minimize all forms of pollution.
- To process organic products using renewable resources.
- To produce fully biodegradable organic products.
- To work as much possible within a closed system.



CHARACTERISTICS OF ORGANIC FARMING

- ❖ Protecting the long term fertility of soils by maintaining organic matter levels, encouraging activity of soil microbial organisms and careful mechanical intervention.
- ❖ Providing crop nutrients indirectly using relatively insoluble nutrient sources which are made available to the plant by the action of soil micro-organisms.
- ❖ Nitrogen self-sufficiency through the use of legume crop and biological nitrogen fixation, as well as effective recycling of organic materials including crop residues and livestock manures.
- ❖ Weed, disease and pest control relying primarily on crop rotations, natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention.
- ❖ The extensive management of livestock, paying full regard to their evolutionary adaptations, behavioral needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing.
- ❖ Careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats.

ADVANTAGES OF BOTANICALS

- Safety to mammals and other non-target organisms
- Eco friendly and biodegradable
- Can be used shortly before harvesting.
- Relatively cheaper
- Acceptability for use in organic agriculture
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-

- Supplemental role to chemical pesticides
- Acceptability for use in organic agriculture

Advantages of Organic Farming

1. Produce optimal conditions in the soil for high yields and good quality crops.
2. Supply all the nutrients required by the plant
3. Improve the soil physical properties
4. Pollution is minimized.
5. Provide more healthy and nutritiously superior food for man and animals
6. More resistant to pests and diseases

Disadvantages of Organic Farming:

1. Lower productivity
2. Lower cropping intensity
3. Unavailability of quality organic inputs
4. Require detailed knowledge to follow proper management practice.

Need of organic farming

- ❖ High energy use
- ❖ Monocropping
- ❖ Imbalance of nutrients
- ❖ Pollution

Options in Organic Farming

- ❖ Pure organic farming
- ❖ Integrated green revolution farming
- ❖ Integrated farming system (IFS)

Important steps to start organic farming:-

- ❖ Enrichment of soil
- ❖ Management of temperature
- ❖ Harvesting and conservation of rain water
- ❖ Maximum harvesting of solar energy
- ❖ Self reliance in inputs
- ❖ Maintenance of natural cycles and life forms
- ❖ Integration of animals in farming system
- ❖ Maximum reliance on renewable energy sources, such as solar power and
- ❖ Animal power

How to achieve those steps?

1. Enrichment of soil – Reduce use of chemicals, use crop residue as mulch, use organic and biological fertilizers, adopt crop rotation and multiple cropping, avoid excessive tilling and keep soil covered with green cover or biological mulch.

2. Management of temperature - Keep soil covered, Planting trees and bushes on bund.

3. Conservation of soil and rain water – Dig percolation tanks, maintain contour bunds in sloppy land & adopt contour row cultivation, dig farm ponds, maintain low height plantation on bunds.

4. Harvesting of sun energy – Maintain green stand throughout the year through combination of different crops and plantation schedules.

5. Self reliance in inputs – develop your own seed, on-farm production of compost, vermicompost, vermin wash, liquid manures and botanical extracts.

6. Maintenance of life forms – Develop habitat for sustenance of life forms, never use pesticides and create enough diversity.

7. Integration of animals – Animals are important components of organic management and not only provide animal products but also provide enough dung and urine for use in soil.

8. Use of renewable energy – Use solar energy, bio-gas and bullock driven pumps, generator and other machine.

Policy taken by government

National governments can play a role in encouraging the adoption of organic agriculture in developing countries. Research and development, education and extension into organic agriculture methods, legalization of the word "organic" and implementation of a certification scheme, and refraining from manipulating input and output prices (such that organic agriculture becomes less attractive to farmers) as well as the all important issue of land-tenure, all merit policy consideration.

- ✓ **cooperative**
- ✓ **Amendment seed act, 1966**
- ✓ **Pesticide bill,2008**

PRESENT STATUS OF ORGANIC FARMING IN INDIA

- ✓ India ranks 33rd in terms of total land under organic cultivation.
- ✓ Ranks 88th position in agriculture land under organic crops to total farming area.
- ✓ Cultivated land under organic certification - 4.43 million ha (2010-2011).
- ✓ India produced around 3.88 million metric tonnes of certified organic products.
- ✓ India exported 86 items last year (2010-11) with the total volume of 69837 metric tonnes.
- ✓ The export realization was around 157.22 million US $.

Major Components of organic farming

Green Manure: Any crop or plant grown and ploughed under when succulent to improve the soil especially by addition of organic matter.

Composting

A biological process in which micro-organisms both types, namely, aerobic and anaerobic, decompose the organic matter and lower the carbon: nitrogen ratio of the refuse. The final product of

composting is a well-rotted manure known as compost.

Biofertilizer

Preparations containing live or latent cell of efficient strains of nitrogen fixing, phosphate solubilizing or cellulolytic micro-organisms used for application to seed, soil or composting areas with the objective of increasing the number of such micro-organisms and accelerate those microbial processes which augment the availability of nutrients that can be easily assimilated by plants.

Different types of bio-fertilizers: Rhizobium, Azotobactor, Azospirillum, Acetobactor, BGA, Azolla, PSM, Mycorrhizae and PGPR

Biological pest management:

A. Light trap,
B. Organically acceptable chemical alternatives
C. Cultural alternatives and
D. Biological control
a. Botanical,
b. Bacterial
c. Fungal and
d. Viral

CONSTRAINTS OF ORGANIC FARMING

- Lack of Awareness
- Shortage of Bio-mass
- High Input Costs
- Marketing Problems of Organic Inputs
- Lack of Financial Support
- Low Yields
- Cost of organic certification
- Need for national organic policies or strategies

Development in Organic farming

- ✓ Long-term productivity of the land
- ✓ Food security and stability
- ✓ Environmental impact
- ✓ Social impact

CONCLUSION

It appears that India is lagging far behind in the adoption of organic farming. So far, the only achievement seems to be the laying down of the National Standards for Organic Production (NSOP) and the approval of 4 accreditation agencies (all government bodies) whose expertise is limited to a few crops. The following are 67 some of the issues, which require attention at the government policy making levels if we want to lay the spadework for the spread of organic agriculture in the country. Organic farming has the potential to supersede conventional farming in terms of quality agricultural produce apart from the i) hazardous effects of higher doses of chemical fertilizers, ii) application of non biodegradable toxic pesticides, iii) intensive tillage operation reducing C stock of agricultural lands and thus degrading soil health and quality. Though we must keep a balance between quality and quantity to fed the large population over the globe but the implementation of organic farming should be encouraged to maintain soil health and sustainable crop production in future for a better and healthy civilization.

Climate Change and Animal Husbandry

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Climate change refers to a change in the climate patterns of the regions or the globe that can persist for decades or longer, arising from natural causes or human/anthropogenic activity. Climate change is one of the most serious environmental problems ever encountered by the entire global community. The change in the climate is largely attributed to increased release of GHG into the environment and the anthropogenic activities holds responsible for 70% of the global GHG emissions. The major GHGs are carbon dioxide, methane, nitrous oxides and chlorofluorocarbons. Agriculture and animal husbandry is the second largest and alone accountable for 18% of global, anthropogenic or human induced, GHG missions and is by far the single largest anthropogenic user of land. Livestock sector, which supports more than 12% of the world's population for its livelihood is a major anthropogenic source of GHG production and emission. According to FAO, 2014 GHGs emissions by livestock sector consist of enteric fermentation (39%), manure management (26%), feed (21%), land-use change (9%), energy and post farm (5%) at global level.

INDIAN LIVESTOCK PRODUCTION AND CLIMATE CHANGE

Interrelationship between climate change and the livestock production in India can be assessed or viewed in two different points of view.

1. Impact of livestock production/ animal husbandry on climate change.
2. Climate change impact on livestock production/animal husbandry.

According to FAO, 2014, India is one among the six largest GHG emitting countries contributing to 6% of the global GHG emissions. India ranks first in total livestock population which is about 13% of the total world's population. The increased consumption of meat and dairy products has lead to expansion of the livestock industry at a phenomenal rate and is endorsed as a major driver of climate change. Enteric methane emission from

Indian livestock contributes about 15.1% of the global enteric methane mission. Nitrous oxide emissions from livestock production includes animal waste or manure management and indirectly from fertilizers used for the production of feeds and fodders and also from leguminous feed crops. Indian agriculture contributes 19% of GHGs emissions in which livestock contributes 54% and 2.7% from enteric and manure management, respectively.

In a country like India, climate change has induced a supplementary stress on the ecological and socioeconomic systems since these are already under tremendous pressure due increasing population, urbanization, industrialization and land degradation. Climate change hampers the availability of good quality of pastures at a desirable quantity leading to radical nutritional deficiency. Climate change has a control over chemical and physical climatic factors such as ambient temperature, relative humidity, solar radiation and the wind velocity. Change in these factors greatly influences the animal production, reproduction animal health, economics of animal production and natural resource management. Climate change directly affects livestock production especially the crossbred cattle by thermal stress and indirectly by other multiple stresses. Heat stress and nutritional stress are the major factors that severely affect the reproductive performance of dairy cattle. The result of climate change has increased incidence of disease occurrence worldwide. The change in the climatic factors interacts with different organisms in complex and dynamic way and has favored some of the disease causing organisms and vectors leading to disease outbreaks. Further, multiple stresses on the livestock has made them more susceptible to disease because of decreased immunity and nutrition.

CLIMATE CHANGE AND THE INDIGENOUS CATTLE

India has 151.17 million indigenous and 39.73 million crossbred/exotic cattle population and among the indigenous cattle, only 22.21 millions have been described and categorized into 44 different populations including 39 distinct/registered breeds. It is estimated that crossbred cattle, indigenous cattle and buffaloes emitted 36.65, 96.85 and 120.83m tones of methane in 2012. There is an increase by 54.65 and 9.32% of methane emissions from crossbred and buffaloes, respectively, when compared to the emissions in 2003, whereas there is a decrease in the amount of methane emission by the indigenous cattle by 10.1%, when compared to the emissions in 2003. In the last two decades indigenous cattle population has decreased by 15.39% and even now the population of crossbred is increasing over indigenous cattle population at an alarming rate.

In the recent years there is decrease in the quality and quantity of milk production by crossbred animals mainly because of its inability to cope with the changing climatic scenario. The amount of milk obtained from crossbred animal is mainly dependent on feeding of high cost concentrates. Currently in India, there is a deficit of feed resources to the tune of

7.58%, 56.73% and 30.37% for dry roughages, green grasses and concentrates, respectively, and adding to that only 3.3-4.41% of total cultivable area is under green forage production. Further hopes of feeding the animals and safeguarding their food security depends on the utilization of unconventional feeds such as crop residues and industrial by-products.

Due to increased ambient temperature, crossbred animals try to maintain the core body temperature by increased sweating and panting, resulting in shift of the energy for the maintenance of the animal than the production. On the contrary, indigenous animals have more number of and larger sweat glands in relative to crossbred animals due to higher surface area of the skin and thus increasing the capacity for heat loss and aiding in maintaining the core body temperature of the animal. Properties of the hair coat in Zebu cattle enhance conductive and convective heat loss and reduce absorption of solar radiation. Furthermore, our indigenous cattle have physiologically low metabolic rate making them more adaptable to varied climate change in tropics and subtropics. In addition, scientists have identified the heat tolerance genes in indigenous cattle and this has been considered as one of the important trait in crossbreeding program/policies of many countries in enhancing the livestock productivity. For e.g, in Brazil, Indian cattle breeds have been used for genetic improvement that involves the use of Nellore cattle.

The ability of our indigenous animals to sustain in zero input and its capacity to utilize crop residues and other unconventional feeds makes them suitable for homestead farming of India. The aptitude of indigenous cattle to fight against the increasing diseases in the climate change is reflected in the higher levels of globulins in the blood while creatinine levels are less than that of crossbred cattle. Some of the disease resistance features of the indigenous cattle are listed below.

Name of the disease/condition	Disease resistance	
	Crossbred cattle	Indigenous cattle
Theileriosis	Highly susceptible	97.84%, Resistant
Rinderpest	Highly susceptible	Low susceptible
Anaplasmosis, Piroplasmosis	Highly susceptible	Resistant
Heat resistance	36 ºC	More resistant till 40.5 ºC
Solar radiation resistant	Highly susceptible	Highly Resistant
Insect resistance	Susceptible	More resistant

CONCLUSION

Climate change is real and is a multidisciplanary issue which needs to be addressed through cross sectoral union that requires interdepartmental synchronization as well as productive engagement with all concerned stakeholders. Livestock production system is the major contributor to the climate change and is also sensitive to the

changing climate and it's a challenge to a country like India to maintain the equilibrium between the two since over 26% of the agricultural GDP is from livestock production system. In this context, conserving and propagating the descriptive indigenous cattle breeds through selective breeding of the non-descriptive animals would incorporate the desirable traits that are required in the changing climatic scenario.

Impact of Changing Climate and Government Policies

on Arrivals and Prices of Tomato In Kolar Market

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Tomato is an important vegetable crop, which is in national news very often for the reasons of market gluts and distress sales. In India it occupies an area of 0.88 million hectares with an annual production of around 18.73 (000') metric tonnes and India is the second largest producer in the world next only to China. Out of the total annual production of 18.73('000) metric tons, nearly 40% comes from the states of Karnataka, AP and TN. 'Kolar' in Karnataka state is one of the major production centers that feeds the Chennai and other important national markets.

Kolar market on an average receives around 60 % of the total arrivals of tomato in the state on a daily basis, with a volatile pattern of arrivals that change significantly on day to day basis leading to high volatility in daily prices. It is highly paradoxical that while tomato is considered the most profitable vegetable by the growers, at times the price volatility is so much that it becomes uneconomical even to harvest the produce.

Several attempts have been made both by the public as well as the private sector organizations to bring about 'market regulation' through different approaches so as to keep the producer informed about the 'information about different markets' and or 'market intelligence' where in the producer is equipped to take informed decisions with regard to selecting a specific market or timing the sale of his produce in a given market.

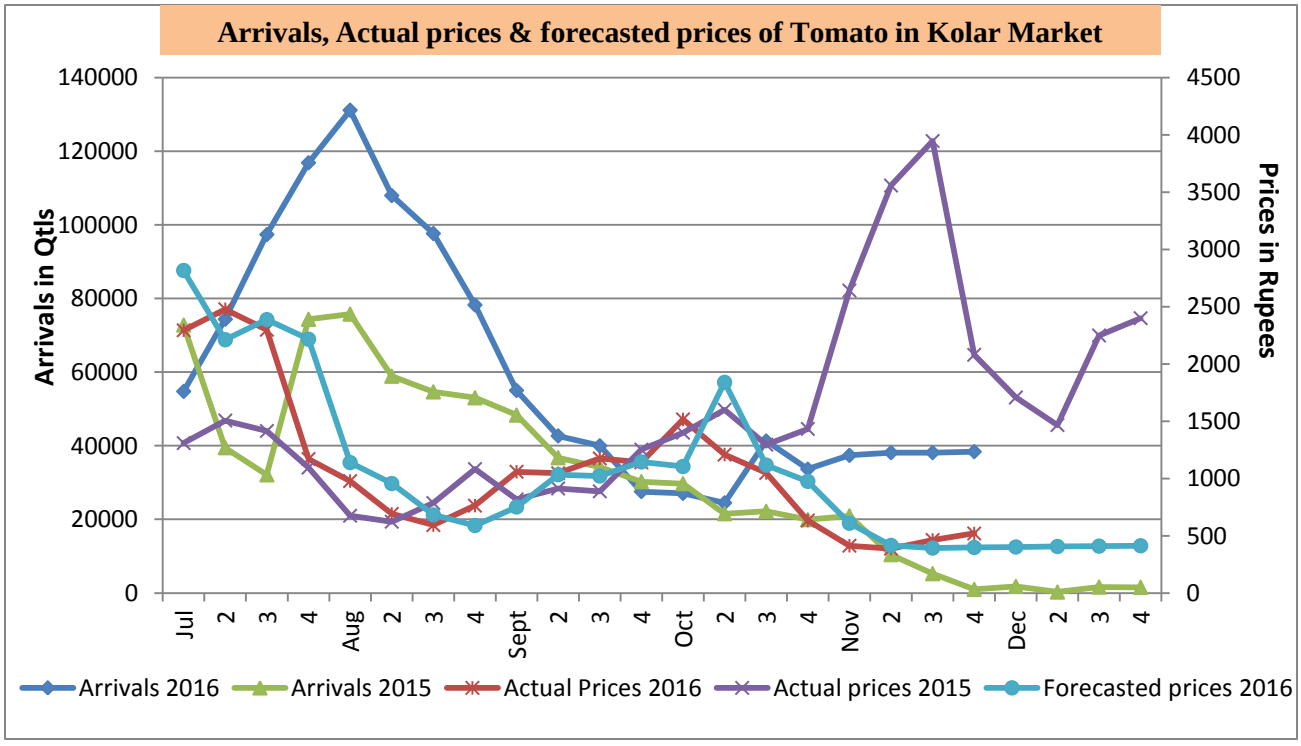
Important among these efforts are 'creating alternate marketing channels with less number of market intermediaries like the 'Raithu Bazars', a network of markets working on the principles of co-operation; 'spot procurement at the market when the price crashes below a point, to name a few. In addition to these efforts, there have been attempts at analyzing the pattern and trend of arrivals and price change in different markets for

Table 1: Deviation between forecasted and actual prices of tomato in Kolar market

Pre-sowing forecasts	Forecasted prices (Rs./Qtl)	Actual market price (Rs./Qtl)	% Deviation
Rabi, Aug - 2014	2690	2660	1.12
Kharif, May- 2015	1131	1162	2.66
Kharif, May – 2016	1882	1941	3.13
Rabi, July – 2016	3550	2760	28.03
Kharif, Oct – 2014	1900	1630	16.50
Kharif, Sep – 2015	1152	1296	11.11
Rabi, Dec – 2014	1955	1730	19.90

understanding the relationship between two markets and the mechanism of price adjustment that is prevalent between them. Attempts have also been made by researchers to analyze the trend and pattern of market prices over the years for utilizing the data for predicting the market prices and disseminating the same to the traders and producers well in advance so that the producers are in a position to make informed decisions on the market sales.

The economics section of the ICAR-IIHR, Bangalore in collaboration with ICAR-NIAP, New Delhi and other collaborating institutions have successfully been predicting the prices of highly seasonal and perishable commodities like tomato and have been disseminating this information to the growers prior to sowing and prior to harvest every season for the last two years. Advanced econometric models like ARIMA



are used at arriving at the forecasted prices that in the past have shown more than 80 to 90% congruence to the actual prices. The table below provides a glimpse of the forecasted and actual prices for tomato in the last few seasons in Kolar market.

Similar effort in the recent few months, starting from July this year have shown wide variation between the predicted prices and the actual prices. Closer examination of this trend through a comparison of the trending arrivals and prices during the same period in 2015 with that in 2016 is attempted here with an analysis of the underlying reasons for the wide variations is presented herewith in Fig 1.

In sharp contrast to the scenario during Ist week of August 2015, when the arrivals of tomato into Kolar market were around 70,000 qtls, the arrivals into Kolar market soared to over 130,000 qtlas in 2016. The arrivals started to show declining trend from 2nd week of august and continued to drop well into the Ist and second week of November during 2015. Similar declining trend was observed during August 2016 as well, though the magnitude of arrivals was much higher in 2016 till the end of August 2016. There was however a slight increase in arrivals during second week of October in 2016 and further in November third week as well. While the prices started rising in October and reached a peak during Ist week of November 2015, the prices have been falling in 2016.

Detailed discussion with traders and farmers of Kolar market indicated that there have been excess arrivals of tomatoes from in and around areas of Kolar since the last three months. Traders also quoted that, even though July and August is not a usual tomato cultivating season, farmers cultivated due to peak prices obtained in the months of June, July and August months in 2015. And this has influenced to increase in tomato production area and glut in the tomato market.

Impeding tension at the border leading to a near stoppage of movement of produce across the border to Pakistan is being stated as one of the important reasons that appear to affect the domestic price. Besides this, the demonetization leading to lack of ready cash have pushed the average daily prices down, while the absence of rains and associated pest breaks have increased the production leading to an uneasy glut in the market.

While the econometric tools have been highly useful in predicting the prices till date, such unprecedented changes in policies leading to these models not been able to be useful in situations of this nature when the markets become highly erratic. Restricted movements and sudden change in policies have become additional impediment besides the erratic weather leading to distress sale among growers of highly perishable commodities like tomato and onion. Government institutions and policy makers need to pay more attention to such trends and have in place measures that could help tide over the situation.

Fig 2.

Fig 3.

Fig. 4

Fig. 5

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Avian Influenza:

A Curse Over Poultry Industry

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There are three influenza genera – A, B and C; only influenza A viruses are known to infect birds. Influenza A is caused by viruses that are members of the family Orthomyxoviridae and grouped in the genus influenza virus A. Many species of birds have been shown to be susceptible to infection with influenza A viruses; aquatic birds form a major reservoir of these viruses, and the overwhelming majority of isolates have been of low pathogenicity (low virulence) for chickens and turkeys. Human beings are also affected by this virus through birds and pigs and it poses a severe threat to human life. Diagnosis is by isolation of the virus or by detection and characterisation of fragments of its genome. This is because infections in birds can give rise to a wide variety of clinical signs that may vary according to the host, strain of virus, the host's immune status, presence of any secondary exacerbating organisms and environmental conditions. Influenza A viruses have antigenically related nucleocapsid and matrix proteins, but are classified into subtypes on the basis of their haemagglutinin (H) and neuraminidase (N) antigens. At present,

Figure 1: Swelling of sinuses

16 H subtypes (H1–H16) and 9 N subtypes (N1–N9) are recognised with proposed new subtypes (H17, H18) for influenza A viruses from bats in Guatemala. To date, naturally occurring highly pathogenic influenza A viruses that produce acute clinical disease in chickens,

turkeys and other birds of economic importance have been associated only with the H5 and H7 subtypes. Most viruses of the H5 and H7 subtype isolated from birds have been of low pathogenicity for poultry. As there is the risk of a H5 or H7 virus of low pathogenicity i.e H5/H7 low pathogenicity avian influenza (LPAI) becoming highly pathogenic by mutation, all H5/H7 LPAI viruses from poultry are notifiable to OIE. In addition, all high pathogenicity viruses from poultry and other birds, including wild birds, are notifiable to the OIE. Due to current outbreaks of avian influenza in India, the present article is written to enhance the knowledge of poultry farmers and common people about this disease.

Clinical signs in birds:

- Vary from sudden death to clinical symptoms
- Occular or nasal discharge
- Coughing, dyspnoea
- Swelling of sinuses and head
- Cyanosis of skin, comb and wattle
- Reduced vocalization
- Diarrhoea
- Reduction in feed and water intake
- Incoordination and nervous signs
- Marked drop in egg production

CLINICAL SIGNS IN HUMAN

- Cough
- Diarrhea
- Laboured breathing
- Fever greater than 100.4°F (38°C)
- Headache
- General ill feeling (malaise)
- Muscle aches
- Runny nose
- Sore throat

Post mortem lesions in birds:

- Hemorrhages on visceral organs eg. heart
- Hemorrhages in trachea
- Hemorrhages in intestine and muscles
- Hemorrhages on mucosal surface of proventriculus, particularly at the junction with the gizzard
- Oedema and hemorrhages in lung
- Necrotic foci on spleen
- Congestion and hemorrhages on ovarian follicles

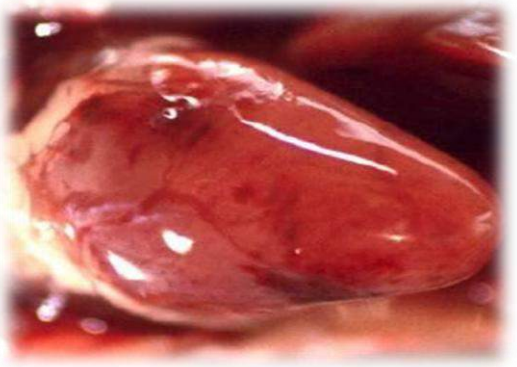

Figure 2: Hemorrhages on heart in chicken

Reporting System of Avian Influenza Outbreak

- Forward samples immediately to RDDLs/NIHSAD (Regional disease diagnostic laboratory/National institute of High Security and animal disease)
- Intimation to the Joint Secretary (Livestock Health), in the Department of Animal Husbandry, Dairying and Fisheries, Government of India.
- RDDLs/ NIHSAD communicate the results of testing to the Secretary, Animal Husbandry Commissioner and Joint Secretary (Livestock Health) of DADF and to Chief Secretary of the concerned State.

Figure 3: Culling of birds by twisting of the neck (cervical dislocation)

Immediate actions will be taken by State Govt.

- Setting up of a control room in the State, constitution of rapid response time (RRTs) , setting up of infected zone of 1 Km, surveillance zone of 01-10 Km, medicines/disinfectants
- PPE kits, Supply of *tamiflu*.
- Restriction of movement of birds from infected & surveillance zone, Mass culling
- Information, Education & Communication

Is it safe to eat poultry and poultry products?

- The virus is destroyed at a temperature of 70^{o} C for 30 minutes.
- So, Poultry and poultry products can be prepared and consumed as usual
- After handling poultry and eggs, one should wash hands and other exposed parts with soap and water.

Prevention & Control

- Biosecurity measures
- Stamping out infected flocks
- Vaccination of flocks at high risk
  - Killed vaccines
  - Live attenuated vaccines are not licensed for poultry
- Mass-vaccination with most commonly used strain in an inactivated vaccine in the entire surveillance zone (10 Km) as ring vaccination could be adopted.
- GOI may be contacted stating reasons for vaccination, no. of domestic avian species at risk, no. of doses required etc.
- After three weeks, the poultry or products from the surveillance zone, which had undergone vaccination, can be allowed to be traded outside the zone.
- Vaccination not as a routine prophylaxis.

DIAGNOSIS

- Virus isolation
- Serological Tests

a. Type-Specific Tests (type A, B, C)

- Agar gel immunodiffusion (AGID) test

- Enzyme-linked immunosorbent assay (ELISA)

  b. Subtype-Specific Tests (H or N subtype)
- Haemagglutination-inhibition test
- Neuraminidase-inhibition test

➢ Molecular diagnostics- RT-PCR

CONCLUSION

- Enhanced global active surveillance is needed to monitor the spread of these influenza viruses through wild birds.
- Efforts could clarify the epidemiology of HPAI virus and facilitate early recognition of novel genotypes.

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