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Breastfeeding Practices in Infants of Urban and Rural Areas of Parbhani District, Maharashtra

Ashwini Bidwe[1], Vijaya Nalwade[2]

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Abstract

Breastfeeding is associated with numerous health benefits to offspring and mothers and may improve maternal-infant bonding. The present investigation was carried out to assess the breast feeding practices among rural and urban area of Parbhani District. A community based, cross-sectional study was conducted in an urban and rural area of Parbhani District, Maharashtra state. The study variables such as initiation of prelacteal feed, colostrum, time of initiation of breast feeding frequency of breast feeding, breast feeding during mothers illness and reasons for discounting breast feeding. The data generated was analyzed statistically. Results inferred that near about 50 percent rural and 40 percent urban mothers followed the practice of giving prelacteal feed to the new born. Maximum per cent of urban (80) and rural (77) mothers gave colostrum to their infants. It was noticed that among 50 percent of infants weaning was not started at the recommended age, i.e. 6 to 7 months. More per cent of rural (88) mothers have started breast feeding within one hour of delivery as compared to urban (53.5) mothers. It was found that the scheduled feeding pattern was followed among urban (59%) mothers. Whereas, in rural (55%) mothers demand feeding was more commonly used. Majority of mothers from both areas found to be breast fed their infants even when they were suffering from illness, which found to be good practice. In conclusion results inferred that there is need to improve the awareness of mothers regarding various aspects of correct and sound breast feeding practices to promote the heath of infants.

Keywords: Breast feeding; Infant; Prelacteal feed; Colostrum

Introduction

Infant and young child nutrition has been engaging the attention since long for the very simple reason that growth rate in the life of human being is maximum during the first year of life. Infant feeding practices comprising of both the breastfeeding as well as complementary feeding have major role in determining the nutritional status of the child (Govt. of India, 2006).

Although Breast feeding is universal in India, but exclusive breast feeding and appropriate weaning practices rates are not satisfactory, various socio cultural factors influence these practices which vary from region to region (Ministry of Health and Family Welfare, 2007). However, the prevalence of exclusive breastfeeding is very low in many developing countries.

Breast feeding has a unique biological and emotional influence on the health of both the mother and the young child (Ogunlesi, 2010). Breastfeeding

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is not only important for young child survival, health, nutrition, the development of the baby's trust and sense of security but it also enhances brain development and learning readiness as well. A breastfed baby is likely to have an IQ of around 8 points higher than a non-breastfed baby.

Appropriate breast feeding practice ranks first among the most effective interventions to improve health of child. A great asset in India is that an average Indian mother although poor in nutritional status, has a remarkable ability to breast feed her infant for prolonged periods. However, some inappropriate breast feeding practices do exist in India. Therefore the present investigation was carried out to assess the breast feeding practices among rural and urban area of Parbhani District.

Materials and Methods

A cross-sectional research design was adopted for the study and a purposive random sampling technique was followed to select the subjects. A total sample of 400 mothers with infants of the age of 0 to 24 months was selected from urban (200) and rural (200) areas of Parbhani district of Maharashtra state. Four talukas namely Parbhani, Selu, Manwat and Gangakhed and one village from each talukas namely Brahmangaon, Mhalsapur, Rudhi and Koudgaon respectively were selected for the study. The data was collected by questionnaire and in-depth interview. The efficacy of questionnaire was pretested through pilot survey carried out on 25 selected mothers for assessing feeding practices of infants. All the selected 400 mothers were personally interviewed by the investigator with the help of pretested questionnaire so as to elicit the information regarding initiation of prelacteal feed, colostrum, time of initiation of breast feeding, frequency of breast feeding, breast feeding during mothers illness and reasons for discontinued breast feeding. The data generated was analyzed statistically.

Results and Discussion

Out of 400 selected mothers from urban and rural areas 167 had given some kind of prelacteal food to the infant. The percentage was more among rural mothers (47.5) than that of urban mothers (36). The difference was found to be significant statistically (Table 1). Prelacteal foods are usually administered due to colostrum deprivation and delayed initiation of breastfeeding, apart from some social customs and beliefs. In present study more percentage of infants were given prelacteal foods it may be due to advise given by elderly females of families (Grand parents) as they played a major role in influencing the practice of breast feeding. Most of these elders were illiterates and they considered colostrum as something indigestible, not good for baby's health and also unaware of hazards of prelacteal feeds. Even other group of workers (Gupta et al., 1997, Dave et al. 2014 and Kumar et al.,2015) also reported that the percent of giving prelacteal feed was ranging from 40 to 48 which is near about similar to results of present study.

Table 1: Percentage of prelacteal food given to new born baby (N = 400)

Sr. No.	Categories	Number	Percent	'Z' test
1	Urban	72	36	2.76**
2	Rural	95	47.50	

** — significant at 1% level

It is cleat from Table 2 that honey, sugar water, glucose water and *gutti* were commonly used as prelacteal foods for infants. It was found that honey was given as a prelacteal food among more number of infants from urban (62) and rural (82) areas. While sweet water as prelacteal food was given to 8 and 10 new born babies of urban and rural areas. Whereas, only two each of urban and rural mothers gave glucose water to infants as prelacteal feed even *gutti* was given as a prelacteal feed to only one infant from rural area. It was found that more percent of urban mothers found to be giving prelacteal food to infants than those of rural mothers.

On the whole, results showed that practice of giving prelacteal foods was more common among selected respondents but this custom increases the chances of infection to the infant. Moreover prelacteal foods are not recommended because of the resulting effect on the onset of lactation and on perinatal morbidity and mortality. This finding is in close conformity with results of the study conducted by Galhotra et al. (2008), Patil et al. (2009) and Suhsma et al. (2013). They found that commonly given prelacteal feed was honey.

Table 2: Type of prelacteal food given to new born baby

Sr. No.	Type of food	Percent of new born baby	
		Urban (*N* = 72)	Rural (*N* = 95)
1	Honey	86.1 (62)	86.3 (82)
2	Glucose water	2.7 (02)	2.10 (02)
3	Sugar water	11.1 (08)	10.5 (10)
4	Gutti	–	0.1 (01)

Figures in parentheses indicate number

Information on colostrum given to the selected infants and young children is presented in Table 3. Results indicated that maximum percent of urban (80) and rural (77) mothers gave colostrum to their infants. Whereas, minimum percent of urban (20) and rural (23) mothers had discarded colostrum due to the advice of relatives and not having awareness regarding benefit of colostrum. This wrong belief in community should be changed by creating awareness about the importance of colostrum to their child. The practice of breastfeeding was followed by all the selected mothers of urban and rural areas.

A study conducted by Ashwini et al. (2014) revealed that the significant difference was noticed in the practice of discarding colostrum between urban and rural mothers. On the contrary, the results of the present study showed no significant difference.

The findings of present study indicated that the mothers found to discard colostrum due to elders' advice. Similar observations were also reported by Yadav and Singh (2004) and Ashwini et al. (2014). Hence, it was advisable not to educate only mothers but also the elder members of the family.

Table 3: Information on colostrum given to infants and young children

Sr. No.	Colostrum	Percent of Infants		'Z' test
		Urban (*N* = 200)	Rural (*N* = 200)	
1	Yes	80 (160)	77(157)	0.70^{NS}
2	No	20 (40)	23 (46)	

Figures in parentheses indicate number NS- non significant

It was found that maximum percent of rural (88) and urban (53.5) mothers had initiated the breast feeding within one hour of delivery and significantly more by rural mothers whereas 37 percent and 8.5 percent urban and rural mothers reported that they initiated the breast feeding within one to five hours of delivery respectively. Majority of urban and rural mothers initiated breast feeding within one hour of delivery which is nutritionally sound practice. Even the World Health Organization recommends initiation of breast feeding within one hour of birth which provides benefits for both mother and child (Table 4)

Earlier researchers Galhotra et al. (2008) and Nayak et al. (2010) observed that majority of mothers started breast feeding within one hour of delivery. Thus the results of the present study are in conformity with the findings of the above studies.

The findings of the study also revealed that 9.5 percent and 3.5 percent of urban and rural mothers had initiated breast feeding after 24 hours of delivery respectively. Delayed initiation of breastfeeding was noticed in more percent of mothers of urban area as compared to rural area. It may be most probably related to the physical condition of the mother after delivery. It was noticed that the percent of caesarian delivery cases were more among urban mothers and they were not feeling well enough to be able to breast feed in painful conditions associated with caesarian section. The results of the study conducted by Muchina and Waithaka (2010) and Patel et al. (2011) are in line with the results reported in present study that, the reasons for failure to breast feed within one hour, were insufficient milk production, inability of the infant to suck at the breast and obstetric problems and caesarean deliveries.

A relatively very high percent (97.5) of urban as well as rural mothers continued breastfeeding after six months of infants age. Whereas the remaining

2.5 percent of urban and rural mothers were discontinued breastfeeding after six months of infants age because of inadequate milk secretion, mothers illness and mother became pregnant again.

In regard to frequency of breastfeeding it was noticed that more percent of urban (59) mothers were breastfeeding their infants on regular interval and the remaining 41 percent mothers breastfed their infants on demand. In case of rural mothers it was found that maximum percent of rural (55) mothers breastfeed their infant on demand whereas minimum percent (45) of mothers had frame schedule to breastfed to their infants. Difference in the practice of demand and scheduled breastfeeding pattern among urban and rural mothers was significant statistically. It was noticed that around 50 percent were not following demand feeding pattern. It has been observed that working place of more number of urban mothers was far away from home compared to rural mothers. Hence, probably it was not possible for them to practice demand feeding as done by rural mothers. Apprehension among the urban mothers regarding the growth of the infant may also be the reason for their time bound feeding.

Srivastav et al. (2010) also observed that 38 percent mothers were breast feeding on demand. On the contrary, Kumari et al. (2017) reported that all the studied subjects followed "On demand" breast feeding schedule. This is in concurrence with a WHO collaborative study (1981) conducted on rural Indian women were 100 percent of mothers breast fed their infants on demand.

Table 4: Distribution of infants according to breastfeeding initiation time (*N* = 400)

Initiation of Breastfeeding	Percent of Infants		'Z' test
	Urban (*N* = 200)	Rural (*N* = 200)	
<1 hrs	53.5 (107)	88 (176)	7.84**
1 hr–5 hrs	37 (74)	8.5 (17)	12.6**
5 hrs–24 hrs	–	–	–
>24 hrs	9.5 (19)	3.5 (7)	2.16*

Figures in parentheses indicate number **—significant at 1% level *—significant at 5% level

Information of breastfeeding during mothers illness is given in Table 5. Out of 400 selected mothers 182 urban and 180 rural mothers had some or other illness during the period of lactation. Results showed that majority of urban (70%) and (59.51%) rural mothers breastfed their infants when they were suffering from illness and the remaining 21 percent and 30.5 percent mothers of urban and rural areas stopped breastfeeding when they were sick (Table 6). Mothers discontinued breastfeeding during illness due to advice given by mother or mother-in-law, doctor's and friends. Sushma et al. (2013) reported that more percent of mothers continued breast feeding even during illness than that of found in present study.

Table 5: Percentage of breastfed infants during mothers illness

Categories	Percent of Infants		'Z' test
	Urban (*N* = 200)	Rural (*N* = 200)	
Yes	70 (140)	59.51 (119)	1.84 NS
No	21 (42)	30.5 (61)	1.64 NS
Not Applicable	9 (18)	10 (20)	–

Figures in parentheses indicated number NS— non significant

Reasons for discontinuation of breast feeding are given in Table 6. Out of the selected 400 mothers 28 urban and 55 rural mothers discontinued breast feeding to their infants. It was found that 25 percent urban and 29.1 percent rural mothers discontinued breastfeeding to the infants due to inadequate milk secretion. Whereas infants were not sucking well on breast was one of the reason quoted by three and nine mothers of urban and rural areas respectively. It was observed that 10.71 percent of urban and 16.36 percent of rural mothers discontinued breastfeeding because they became pregnant again. Even 28 percent of urban and 16.36 percent of rural mothers discontinued breastfeeding due to

the illness. Only seven mothers belonging to urban area stopped breastfeeding because of their job pattern.

These findings are in close conformity with results of the study conducted by Taneja (2003) who reported that 66.7 percent of mothers belonging to rural area of Delhi were discontinued breastfeeding due to insufficient milk secretion. Even Sushma et al. (2013) reported inadequate milk (54.6%) secretion followed by sucking difficulties by the baby were the most common reasons quoted by mothers for discontinuation of breast feeding.

Table 6: Reasons for discontinuation of breastfeeding to infant

Reasons	Percent of Infants	
	Urban (*N* = 28)	Rural (*N* = 55)
Inadequate milk secretion	25 (7)	29.09 (16)
Not sucking well on breast	10.71 (3)	16.36 (9)
Mother got pregnant	10.71 (3)	32.72 (18)
Mother became sick	28 (8)	16.36 (9)
Job pattern of mother	25 (7)	–

Figures in parentheses indicate number

Conclusion

On the whole, Practices of giving prelacteal feeds was more among urban mothers than that of rural mothers mostly honey was given as a prelacteal food. Majority of the mothers breast fed their infants and gave colostrum to their infants. More number of rural mothers have started breast feeding within one hour of delivery as compared to urban mothers. It was found that the scheduled feeding pattern was followed among urban area whereas in rural area demand feeding was more common. Majority of mothers from both areas found to be breastfed their infants even when they were suffering from illness. Still there is a scope for improving correct and sound practices of breast feeding through mass media and implementation of relevant programmes at community.

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Prevalence of Parkinson's Disease, Diagnosis with its Life Expectancy

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Abstract

The disease of any kind causes bad effect on the health of human being. Ignoring the health problems leads to devastation of one's body. Parkinson's disease is one such disease. Millions of people suffered from this disease. The diagnosis of disease is very important before thinking of any further step. Parkinson's disease is neurodegenerative disorder. The diagnosis and cure is essential for overcoming the hurdles related to this neurological disorder. The diagnosis of the disease have been done. The data have analysed and the results are computed, tested and verified with the maximum survival of the patients using SPAR 2. It gives possible causes with the challenges and the solution using various computer based algorithm. Rigorous experimentation have been done by using different datasets of the disease and it gives promising results. Data is further tested and verified by SAS software and computation RMSE, General Mean and R Square is also obtained. The computation of ANOVA for Effects for each parameter of the patient is determined. The pair wise comparisons have also done for data sets and the statistical significance of the result is tested by computing the Critical Differences of characters at 5% and 1% levels of significance.

Keywords: Parkinson's disease; Tremor; Stiffness; Psychology; Memory; Analysis; Significance; Life Expectancy; Red tulips.

Introduction

The most devastating of nervous system affects the large population. The Red tulips represents the symbol of Parkinson's disease. It was on April 11, 2005 the red tulips was launched as the international symbol of Parkinson's disease during the 9th World Parkinson's Disease Day conference in Luxembourg. The red tulips which rises from the bare earth to bloom gloriously each spring was chosen as the symbol of hope for Parkinson's sufferers.

There is actually a tulip named 'Doctor James Parkinson's. It is red triumph tulip with a white margin named for the English Doctor who first described the disease in 1817 and was launched by 1981 its hybridizer J.W.S. Vander Wereld himself suffering from Parkinson's disease.[9]

Parkinson's disease is degenerative, progressive disorder that affects nerve cells in deep parts of the brain called the basal ganglia and the substantia nigra. Nerve cells in the substantia nigra produce the neurotransmitter dopamine and are responsible for relaying messages that plan and control body movement.[10]

Parkinson's disease are caused by genetic mutations. Hereditary causes of this disease are rare. Only 15% of Parkinson's have a family history.

The month April is Parkinson's disease Awareness month. Parkinson's disease affects the

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eyes. It causes a lot of retinal cells in the eye that rely on dopamine to process and perceive color. Parkinson's may also impact the eyelids. People with Parkinson's disease blink less frequently, which can lead to dryness, irritation or burning of the eyes. Sometimes it causes blurred vision.

The disease symptoms gradually sometimes starting with a barely noticeable tremor in just one hand. Tremors are common, but the disorder also commonly cause stiffness or slowing of movement. In the early stages of Parkinson's disease, face may show little or no expression. The arms may not swing while walking in most of the cases. The most common symptoms such as bradykinesia, tremor, rigidity and postural instability also referred as Parkinsonism.

Many countries have done their trails and survey through questionnaire, awareness program, extension etc. Research and Implementation are still needed for complete satisfaction from devastating disease.

Materials and Methods

SPAR 2.0[5] have been used for diagnosis, prognosis of disease and for finding out the possible causes. This software consists of many innovative modules based upon advanced statistical and computer methodologies with techniques. This software has been developed using Visual C^{++}. This platform and technology[1-4] is suitable for software development. It utilizes various key features of object oriented technologies such as its ability to programme in an event driven operating system with great ease, write code for events automatically, optimize code capability for native platform, etc. The basic reason behind selection of this technology was its superior abilities for code reusability, inheritability, encapsulation, portability and modular development. The concept of various scripting languages have been used and this expert system is very easy to use and beneficial for everyone who is directly or indirectly related to this field.

Except this software, many other Software tools and engineering techniques have also been used which is mentioned in the next section.

Experimental Analysis

Extensive experimentation have been done for disease data sets[8] by SPAR 2.0 The big data for diseases have also been generated to understand the pattern and also been analyzed with the same or different number of the parameters. It gives the pattern identification of the type of disease or disorder, recurrence or non-occurrence of disease, survival or mortality percentage etc. Depending upon the level or type of disease, the procedures of corresponding treatment is implemented. It also gives the relationships among various parameters of the patients. It gives the diagnosis and prognosis of the disease. Comparisons have been made with the control, i.e. which has been expected for the various categories of disease. The prediction or the decision given by the algorithm is also statistically tested at different level of significance for all the data sets. The mean, standard deviation and coefficient of variation of each type of category is evaluated separately and statistically tested at different levels of significance. Further verification or analysis of the result is tested by SAS.[6] The effect of each parameter on the survival percentage of the patient is also determined and it is statistical significance is obtained at different level of significance. Generally, except the medical science the statistical significance is acceptable at various levels but here the question arises for the life of a patient not for the item/commodity/resource, i.e. life of a human being and he/she is not to be recommended and acceptable even at low level. So through this algorithm and even through SAS, computed the statistical significance at 5% and 1% respectively to avoid the risk of the life of a patient. So, this way the health experts or the doctors can improve the quality of life by appropriate prediction, diagnosis and prognosis of the disease or disorder.

The various symptoms Trembling, Depression, Fatigue, Insomnia, difficulty in voice, difficulty in walking, Dyskinesia, Constipation, Rigidity are represented by 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively. It is clearly shown in Fig. 1 that the percentage of trembling, walking, fatigue and rigidity is too much as compared to other parameters.

The Life expectancy also have been measured and analyzed through statistical methods by using SPAR 2.[5] In (Fig. 2) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 are represented as Age 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90 years respectively along y-axis. This is age of onset of disease. Life Expectancy of the patients having Parkinson's disease are represented by blue color bars as compared to persons who are not having Parkinson's disease. The results clearly shows that the life expectancy is almost same for people suffered with and without Parkinson's. It actually depends upon the onset of the disease. The people who suffered in young age with Parkinson's die earlier as compared to people who suffered from Parkinson's in late age. We found very rare

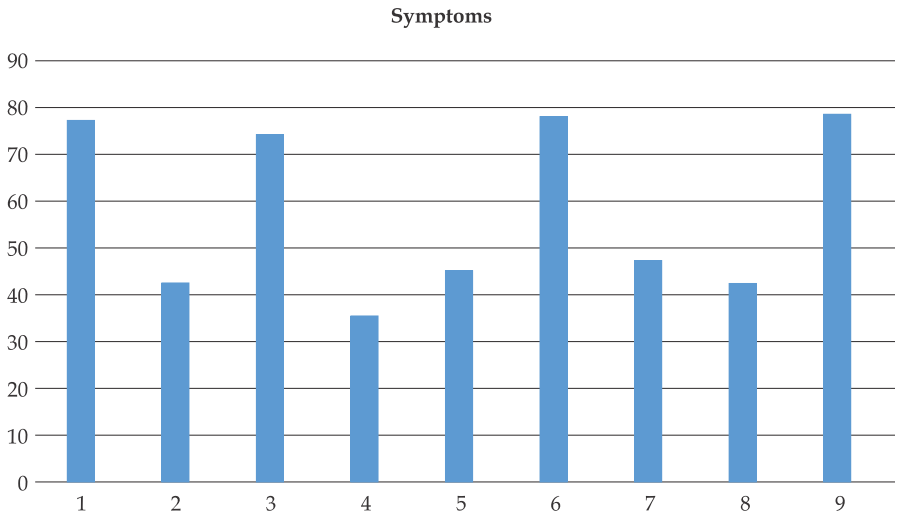

Fig. 1: Parkinson's disease symptoms.

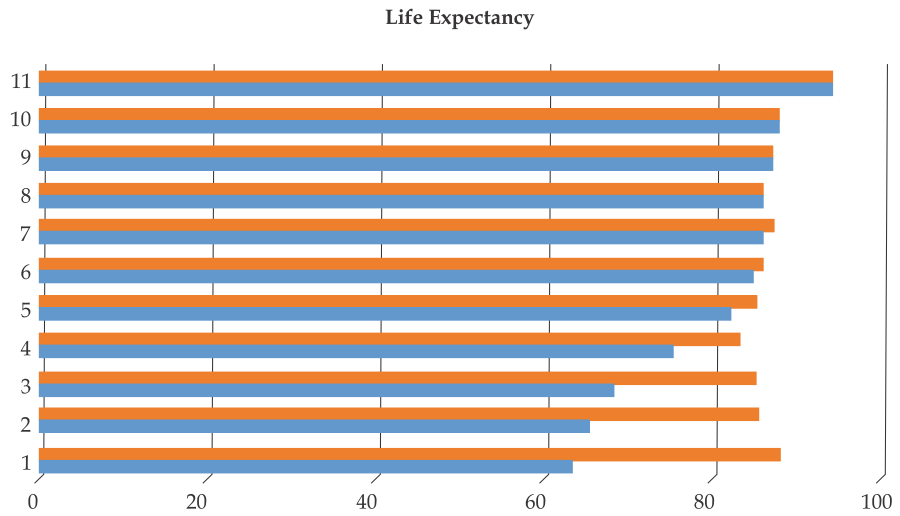

Fig. 2: Life expectancy.

cases of Parkinson's in very young age. So, the life expectancy of Parkinson's is almost somehow very near to normal persons. Rest it also depends upon the severity of other complications with the person.

The above results are further tested and verified by SAS software and computation[6–8] of Root Mean Square Error (RMSE), General Mean and R Square is also obtained. The computation of ANOVA (Analysis of Variance) for Effects for each character (parameter) of the patient and for each data set is determined. The pair wise comparisons were also done for data sets and the statistical significance of the result is tested by computing the Critical Differences of characters at 5% and 1% levels of significance.

Table 1: ANOVA and other measures

ANOVA					
Source	**DF**	**SS**	**MS**	**FCAL**	**Prob>*F***
Treatment	9	346793.5	38532.61	927.7096	0.00001
Error	2370	98438.43	41.5352		
Total	2379	445231.9	187.1509		
R-Square		RMSE	General	Mean	
0.778905		6.444781	6.068546	106.1998	

Table 2: Treatment Mean and S.D. measures

Treatment means and their standard errors		
Treatment	**Mean**	**SD**
1	1.672269	0.470375
2	38.55462	16.0009
3	0.007761	0.003932
4	0.078441	0.064815
5	0.025941	0.013182
6	0.133135	0.088013
7	0.722332	0.271715
8	18.28854	12.5929
9	0.158227	0.097964
10	1.044189	0.65224

Table 3: Pair wise comparisons

All possible paired comparison of treatments Prob>*F*										
S. No	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	.	0.00001	0.00488	0.00703	0.00537	0.00924	0.10798	0.00001	0.01044	0.28782
2	0.00001	.	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
3	0.00488	0.00001	.	0.90478	0.97545	0.83195	0.22657	0.00001	0.79898	0.0795
4	0.00703	0.00001	0.90478	.	0.9292	0.92624	0.27586	0.00001	0.89258	0.10224
5	0.00537	0.00001	0.97545	0.9292	.	0.85603	0.2386	0.00001	0.82284	0.08491
6	0.00924	0.00001	0.83195	0.92624	0.85603	.	0.3187	0.00001	0.96612	0.12317
7	0.10798	0.00001	0.22657	0.27586	0.2386	0.3187	.	0.00001	0.33974	0.58594
8	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	.	0.00001	0.00001
9	0.01044	0.00001	0.79898	0.89258	0.82284	0.96612	0.33974	0.00001	.	0.13383

Table 4: Treatment Critical Differences

Treatment Critical Difference	
C.D. for Treatments (1%)	1.521880
C.D. for Treatments (5%)	1.157953

Most common cause of death in those with Parkinson's disease is pneumonia because the patient's ability to swallow, putting them at risk for inhaling or aspirating foods or liquids into their lungs leading to aspiration pneumonia.

The best treatment for Parkinson's is Levodopa and carbidopa (Sinemet). Levodopa is most commonly prescribed medicine for Parkinson's. It's also the best for controlling the condition particularly slow movement and stiff, rigid body parts. Levodopa works when your brain cells change it into dopamine.

Surgery is an important option for some people suffered with Parkinson's to help treat the symptoms. Deep brain simulation is the most common surgery for the Parkinson's. It has fewer risks and disrupting electrical signals in the brain, rather than destroying tissue. It improves the communication between brain cells. It reduces symptoms such as tremor, slowness and stiffness

Nutrition is very important for overcoming the hurdles. Vitamins are good for Parkinson's disease such as Antioxidant Vitamin C, E, B12, B6 are very important to include in some way. By varying the food of different types, increasing the fiber intake and inclusion of whole grain food, brown rice, whole wheat bread etc. Green tea, aerobic exercise, eat fresh fruits and vegetables. The Ginger and turmeric will also be beneficial for health. The massage with sesame oil is very effective and gives muscular relaxation, improves walking abilities, increase performance and relief up to large extent.

Pain is common in Parkinson's but perhaps unexpected. The personality changes because of

Parkinson's. Stressful life events may increase the risk of Parkinson's disease. The stress damages the dopamine cells resulting in severity of disease.

Family members, friends and care givers may notice changes in personality brought on by neurological changes in the brain. The changes can be varied. People with earlier Parkinson's can safely drive but as the stage increases very fatal symptoms of Parkinson's Disease give up driving is best.

Conclusion

The impact of Parkinson's disease goes beyond the physical effect on movement or control of movement. The progression and the extent of the disease affects not only an individual's ability to take an active role in everyday life but also his or her desire to do this. The diagnosis of the Parkinson's disease and the analysis have been done by using advanced statistical methodologies, software and algorithms. Rigorous experimentation have been done and analyze the data with promising results. More awareness program should be started so that the apprehension of this disease will be overcome. The day is not very far when people patiently understand the symptoms of the disease and getting the solutions from the scientist, doctors and experts worldwide.

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"Awake each morning. Each new day renews our life, our contract to keep living. Strive to live forward and always remember that we are still in the driver's seat of our world. Live decisively even as we accept the problems from Parkinson's."

—Frank C. Chruch

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Potential Application of Nanotechnology Based Innovations in Meat Industry

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Abstract

The demand of technology and innovations is increased in meat industry due to consumer awareness, health concern, sustainable production and higher socio-economic status. Nanotechnology includes the application of particles/materials at the Nano scale. Nanotechnology is new and innovative field of meat industry that involves the manufacture, processing and preservation of meat and meat products by controlling shape and nano size of particles to improve image of meat industry. Some emerging applications of nanotechnology like biosensors, intelligent, active and smart food packaging system and nano encapsulation of bioactive compounds can be used in bacterial identification and monitoring of food quality in meat industry. Nanotechnology has great potential to make available an general idea of current as well as future aspects of nanotechnology in meat and meat bio processing industry.

Keywords: Nanotechnology; Bio nanocomposites; Antimicrobial packaging; Nanoencapsulation; Nanosensors.

Introduction

The need for superior technology is raised with the advancement in meat science and world's growing need and concern over meat as a potential food source. Technologies that can help us to cope up with the complexity in scientific and engineering challenges in meat and meat processing industries. The answer to which is the most abundantly potential source of technology, i.e. Nanotechnology. According to National Nanotechnology Initiative (Arlington, VA, USA) nanotechnology is "the understanding and control of matter at dimensions of roughly –100 nm, where unique phenomena enable novel applications".

Enormous challenges are facing by food and bioprocessing industry for developing and implementing systems which can produces high quality, safe food along with this feeds while also being efficient, environment friendly and sustainable as well (Manufacture, 2006)

To combat these complex challenges innovative and newer as well as socially acceptable technological tools and processes are required in the meat industry. Nanotechnology is the emerging answer to these challenges to thus meet up the demands of the growing world population, which will be possible with increase in the economic status of the developing countries which comprise of major population part as well as also because of its social acceptance being a scientific technology. The impact of nanotechnology at least $3 trillion

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across the global economy 2020, Subsequently nanotechnology industries all over the world needed at least 6 million workers to support them by the end of decade (Roco et al., 2010).

Product can be described on the basis nanotechnique only when following approaches have been used in the production system.

A. When several ingredients have been processed to form nanostructures e.g. Nanosized nutrients to enhance the bioavailability of nutrients and improve sensory properties of product.
B. Where nanosized or nanoencapsulated additives and supplements have been incorporated in a product.
C. If the packaging materials utilize nano-particles to improve their quality.
D. When nanotechnology based device have been used in the packaging and processing of a product e.g. Nanosensors.

Application of nanotechnology in meat industry

Alfaand Elneshwy (2010) used the nanotechnology-based carrier system using 30 nmmicelles by incorporating in many additives to increase the productionprocess, stabilize colour, improving taste in industrial sausage. Weiss et el. (2006) used a nanoscale edible coatingwhich can be used as a medium to deliver colours, flavours, antioxidants, enzymesas well as developing the coating as thin as 5nm wide, which could be used onmeat, meat-based products and cheese etc. Shefer and shefer (2003) also developed the encapsulated system which act as vehicle to delivers the nutrients like protein and antioxidants for specifically targeted nutritional and health benefits.

Yusop et al., (2012) incorporated the nanoparticle paprika oleoresin which enhances the quality of products, increases the effets of marination and the sensory attributes of the chicken breast fillets. Cubuku et al., (2007) made a glassy carbon paste electrode which was based on xanthin oxidasec (XOD) and gold nanoparticles for the chronoamperometic detection of hypoxanthine in tuna fish samples, where the Analytical characteristics were determined, but no LOD was reported. Fernandez et al. (2010) reported that detectable levels of silver ions which leached out in the meat exudates when nanoparticle based coating was used.

Mills and Hazafy (2009) and Duncan (2011) developed the nanotechnology based sensor which detected the biogenic amines which were produces in the spoilage of fish and meat.

Abdou et al. (2012) observe the effect of anitimicrobial activity of chitosan nanoparticle on the growth of microorganisms in fish fingers and found that chitosan edible coating showed decreased bacterial counts. Joe et al., (2012) made nanoemulsion by using sunflower oil for processing of Indo-pacific market staeks, they observed that microbial growth decreased uo tp 12 hr except for control, as well as shelf life increased up to 48 hr.

Brody et al. (2008) prepared Durethan, a meat-packaging product of Bayer, which was polyamied plastic film incorporated with clay nalparticles and it act as an oxygen, moisture and carbon dioxide barrier. Fernandez et al. (2010) stated that antimicrobial application of cellulose pads which contain silver nanoparticle which generated from silver ions in situ and they found lower microbial load in exudates of beef meat packed in modified atmosphere packaging.

Panea et al. (2013) Reported that Zinc oxide (ZnO) and silver (Ag) act as a potent antimicrobial when used in as a nanocomposite with Low density polyethylene and found that inhibition of pathogens like P. Aerugenosa and L. Monocytigenes by using of this type of pacjaging materialfor chicken breast.

Villamizar et al. (2008) developed a network of single walled carbon nanotubes for construction of a Field Effect transistor biosensor for Salmonella infantis Associated with the egg and especially the chicken meat industry and the device could detect at least 100 CFU ml^{-1} of the pathogen in 1 h.

Use of Nanotechnology in packaging

With increasing use of various technologies in the meat and meat processing industry, by using of nanotechnology biochemical and molecular pathways can be used directly to increased the shelf life whose qualities has been modified at molecular level. It gives a pathway to the future of food industry where something new and acceptable can be created which no other technologies offer.

The utmost motive of packaging is to ensure enhanced shelf life without spoilage and any alteration in the qualities of the product, i.e. Taste, aroma, appearance etc. Nanotechnolgy provides greater control in the packaging system, along with

a guarantee of a superior shelf life product. Muscle foods are high in protein, perishable commodity, because of that they are ideal for nanotechnology assisted packaging.

As per Nanoposts Report (2008), nanotechnology based packaging may make uo to 19% in the share of nantechnological based products and its application in the global consumer goods industry.

Nanotechnology in the packaging industry can have following approaches (Chaudhry et al. 2008):

A. Incorporation of nanoparticles in the packaging materialto enhances the properties like flexibility, barrier, strength etc.
B. Active packaging; incorporation of nanoparticles having antimicrobial as well as oxygen scavenging properties.
C. Intelligent packaging; incorporation of nanoparticle devices like nanosensors.
D. Biodegradable polymer –nanomaterial composites.

Intelligent Packaging

Absence of recommended storage conditions may lead to products quality deterioration, and may further lead to generation of harmful toxins in the product which may even harm the health of the consumer. Some reports revealed that nanobiosensor for the detection of pathogens in the processing plants, altering the consumer, producers and distributors view on the safety of products (Chen et al. 2006; Helmke and Minerick, 2006). Nanosensors are ables to detection of specific pathogens and its metabolites which can inform the consumers about the products temperatures, light or O_2 exposures (tmpering) history, when these are integrated in packaging system (Cushen et al. 2012). Different detection devices have been developed to detection of various toxins, pathogens and chemicals in food packaging such as nanowires and antibodies (Dingman 2008). It not only helps in malcondition detection but also empowers the producer to auto check if there is any ill manhandling in the processing chain. Nanoparticles used as nanosensors are also able to detect the presence of gasses, aromas, chemical contaminants or respond to changes in environmental conditions (Azeredo 2009; Duncan 2011).

One of these methods is photo activated indicator ink for in-package oxygen detection which is based upon nanosized TiO_2 or SnO_2 particles and a methylene blue where the colour of the films varies according to O_2 exposure– it is bleached when there is no exposition and blue when film is exposed (Milan et al. 2013). Sensors may detect presence of some other gases such as gaseous amines, which are indicators of fish and meat spoilage, in very low concentrations (Mills and Hazafy, 2009; Duncan, 2011). Similar to gas sensors, the moisture sensors can denote the moisture level without destruction of the packaging of a product. This sensor allows quick and accurate determination of package moisture levels without invasive sampling; under the influence of humidity polymer-matrix of the packaging swells, which results in larger degrees of inter-nanoparticle separation and these changes cause sensor strips to reflect or absorb different colours of light (Duncan, 2011). Shan et al. (2009) developed calcium carbonate nanoparticles based xanthine amperometric sensor to determine the freshness of fish samples.

Bionanocomposites

Nanocomposite with biopolymers offer possibility for carbon-neutral biodegradable materials for packaging and create opportunities for developing countries to utilize their agricultural and forestry resources, by-products and wastes for development of biopolymer nanocomposites (Chaudhry and Castle, 2011). The use of nanoclays into a poly lactic acid biopolymer increases barrier properties to oxygen and water vapor and extends the shelf life of food products (Lagaron et al., 2005). Bionanocomposites use biodegradable materials and incorporate nanomaterial fillers to minimise the disadvantages of not using traditional packaging materials (Sorrentino et al., 2007). They not only extend the shelf life of with the aid of nanofillers, but nanocomposite also reduces the use of plastics as packaging materials and supports biodegradation and eco friendly methods of disposal of packaging materials (Sozer and Kokini 2009).

Green Packaging

Natural biopolymer bio-nanocomposites-based packaging materials have great potential for enhancing food quality, safety, and stability as an innovative packaging and processing technology. Plantic Technologies Ltd, Altona, Australia has manufactured and is selling biodegradable and fully compostable bioplastics packaging (CSIRO, 2006), made from organic corn starch using nanotechnology. Bio degradable bio-nanocomposites prepared from natural biopolymers

such as starch and protein exhibited advantages as a food packaging material by providing enhanced organoleptic characteristics such as appearance, odor, and flavor (Zhao et al., 2008).

The unique advantages of the natural biopolymer packaging are that these can handle particulate foods, can act as carriers for functionally active substances and provide nutritional supplements (Rhim and Ng, 2007). Kriegel et al. (2009) have developed a methodology using electrospinning technique for making biodegradable green food packaging from chitin. Chitin is a natural polymer and a main component of lobster shells. The electrospinning technique involves dissolving chitin in a solvent and drawing it through a tiny hole with applied electricity to produce nanoslim fiber spins. These strong and naturally antimicrobial nanofibers were used for developing the green food packaging. Various companies like BASF, Ludwigshafen, Germany; New Ice, Durango, USA; Archer Daniels Midland CO, Decatur, USA; Sharp Interpack, Aylesham, UK and RPC Group, Northamptonshire, UK (BASF 2009; Bordes et al. 2009; Coating & Converting Magazine 2008) have produced food packaging bags and sachets from biodegradable polylactic acid and polycaprolactone obtained from polymer Nanocomposites of corn plant.

Nano encapsulation

Encapsulation may be defined as a process to entrap one substance (active agent) within another substance (wall material). The encapsulated substance, except active agent, can be called the core, fill, active, internal or payload phase. The substance that is encapsulating is often called the coating, membrane, shell, capsule, carrier material, external phase, or matrix. (Wandrey, 2009; Fang and Bhandari, 2010). Encapsulation is used to improve delivery of bioactive molecules (e.g. Antioxidants, minerals, vitamins, phytosterols, lutein, fatty acids, lycopene) and living cells (e.g. Probiotics) into foods (Wandrey, 2009, Vos, 2010]. Encapsulation provide barriers between sensitive bioactive materials and the environment and mask bad tasting or smelling, stabilize food ingredients or increase their bioavailability. Encapsulation also allow easier handling, (b) to help separate the components of the mixture that would otherwise react with one another, (c) to provide an adequate concentration and uniform dispersion of an active agent (Desai and Park, 2005).

Material used in encapsulation should be biodegradable, food grade, able to form barrier and "generally recognized as safe" (GRAS). The most important criteria for selection of an encapsulation material are functionality that encapsulate should provide to the final product, potential restrictions for the coating material, concentration of encapsulates, type of release, stability requirements and cost constrains(Wandrey, 2009). Most widely used for encapsulation material in food applications are polysaccharides Starch and their derivates – amylose, amylopectin, dextrins, maltodextrins, polydextrose, syrups and cellulose and their derivatives are commonly used. Plant exudates and extracts–gum Arabic, gum tragacanth, gum karaya, mesquite gum, galactomannans, pectins and soluble soybean polysaccharides are employed, too. Subsequently, marine extracts such as carrageenans and alginate are also present in foods. Common milk and whey proteins are caseins, gelatine and gluten. Among lipid materials suitable for food applications there are fatty acids and fatty alcohols, waxes (beeswax, carnauba wax, candellia wax), glycerides and phospholipids. In addition to the above, other materials are employed such as PVP, paraffin, shellac, inorganic materials (Wandrey, 2009).

Encapsulating compounds are very often in a liquid form, many technologies are based on drying. Different techniques like spray drying, spray-bed-drying, fluid-bed coating, spray-chilling, spray-cooling or melt injection are available to encapsulate active agents (Gibbs et al. 1999, Zuidam et al., 2009). Spray drying is the oldest and most extensively applied encapsulation technique in the food industry because it is flexible, continuous, but more importantiy an economical operation.

Effect on essential oil on shelf life

Antimicrobial compounds present in foods can extend shelf-life of unprocessed or processed foods by reducing microbial growth rate or viability (Beuchat and Golden, 1989). Essential (volatile) plant oils occur in edible, medicinal and herbal plants, which minimize questions regarding their safe use in food products. Compounds with phenolic groups are most effective (Deans et al., 1995; Dorman and Deans, 2000). The oils of clove, oregano, rosemary, thyme, sage and vanillin have been found to be most consistently effective against microorganisms. They Are generally more inhibitory against Gram-positive than against Gram negative bacteria (Zaika, 1988; Mangena and Muyima, 1999; Marino et al., 2001). Some

which are effective against both groups (oregano, clove, cinnamon and citral; Kim et al., 1995a; Sivropoulou et al., 1996; Skandamis et al., 2002). Some non Phenolic constituents of oils which are more effective (allyl isothiocyanate, AIT; Ward et al., 1998) or quite effective against Gram-negative bacteria (garlic oil; Yin and Cheng, 2003). The oils with high levels of eugenol (allspice, clove bud and leaf, bay, and cinnamon leaf), cinnamamic aldehyde (cinnamon bark, cassia oil) and citral are usually strong antimicrobials (Lis-Balchin et al., 1998b; Davidson and Naidu 2000). Activity of sage and rosemary is due to borneol and other phenolics in the terpene fraction. The volatile terpenes carvacol, p-cymene, thymol, oregano, savory are responsible for the antimicrobial activity. Various spices like garlic, turmeric, ginger, mustard clove etc. show strong antimicrobial activity due to their active principles containing alecin, curcumin, gingibellin, isothiocyante respectively. Among herbs, basil, oregano, rosemary, sage and thyme also exhibit strin anitooxidant and antimicrobial activity and have been used in Indian culinary practices since time immemorial. Different phenolic components in natural essential oils are helpful to increased the shelf life of various meat products with their antimicrobial activity (Deans et al., 1995; Kim et al., 1995 a,b). Although, allyl isothiocyanates in mustard and allicin in garlic and onio are considered as non phenolic aliphatic compounds. Phenolic compound of olive oil (oleuropein) and tea-tree oil (terpenes), which are not classified as either herbs or spices, but show antimicrobial activity (Davidson and Naidu, 2000). Essential oils of plants have been shown to have activity Against Aeromonas hydrophila, Listeria Monocyto genes, Clostridium botulinum, Enterococcus faecalis, Staphylococcus spp., Micrococcus spp., Bacillus spp., Enterobacteriaceae, Campylobacter jejuni, Vibrio para haemolyticus, Pseudomonas fluorescens, Bacillus cereus, Shigella spp., Salmonella enterica, Typhimurium and Enteritidis, and Escherichia coli as well as yeasts and moulds (Saccharomyces cervisiae, Aspergillus Flavus Aspergillus parasiticus) (Karapinar and Aktug, 1987; Beuchat and Golden, 1989; Moleyar and Narasimham, 1992; Hao et al., 1998a, b; Smith-Palmer et al., 1998; Marino et al., 2001; Bagamboula et al., 2003).

Conclusion

Technological progress and revolutionary improvements with efficient economics in meat industry have led to innovation in the packaging line. meat and meat products need a specialized package profile depending upon the type of processing, condition of storage and distribution. New systems, materials, machinery, designs and environmental concerns are some innovations in packaging sector. Therefore, nanotechnology has a great significance on the meat processing industry, especially by extending shelf life of value added meat products along with development of functional meat products and novel packaging techniques. The potential benefits of nanotechnology can be utilized by improving bioavailability, antimicrobial effects as well as targeted delivery system of bioactive compound without any adverse effect on organoleptic properties of meat products.

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Review Article

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Nutrimental and Ethnomedicinal Potential Plants of the Qur'an: An Overview – III

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Abstract

Our ancient literatures of Hindus', Muslims as well as of Cristian's are full of plants described about their nutrimental and medicinal potential. A significant number of plants described in their texts are still unidentified because of least or no interest in plant taxonomy among neither grate scientists in well-developed different organisations nor respected teachers of Universities or Colleges of repute. We can say with confidence that there are no teachers who can teach Plant Taxonomy in significant numbers of academic institutions. A man of Biotechnology can do nothing if he/she can not identify the plant on which the work has to be worked out. As a result, due to non-identification of plants we can not use our wealth of knowledge which has been provided by our ancestors present in form of scripts. We were presented a book written by Dr. M. I. H. Farooqi entitled "Quruani Poudhe-Vagayanic Dhristi Se" while in Seminar organised by UP Biodiversity Board, Lucknow. We found that there are seventy-one plants being reported in Holy Qur'an and Bible. We have consulted the literatures available as well as the tribal of Bahraich about the uses of the plants available. The perusal of the alphabetical list of plants of Holy Qur'an reveals that there are 71 plant species representing 48 genera of 30 families. *Brassicaceae, Cucurbitacea*e and *Moraceae* family were found to be the biggest family represented by 6 plant species each whereas *Caesalpiniaceae, Papilionoideae* and *Poaceae* with 5 plant species each; *Rosaceae* and *Rhamnaceae* with 4 plant apecies; *Mimosaceae, Liliaceae, Pinaceae, Euphorbiaceae, Oleaceae, Lytharaceae, Lamiaceae* and *Arecaceae* with 2 plant species and rest fourteen families viz., *Malvaceae, Asclepidiaceae, Lauraceae, Bixaceae, Dipterocarpaceae, Juglandaceae, Cuprassaceae, Lecnoraceae, Loranthaceae, Anacardiaceae, Sterculiaceae, Ericaceae, Salvadoraceae,* and *Vitaceae* is being represented by single plant species each.

Keywords: Ethnobotanical; Ethnomedicinal; Potential; Plants; Qur'an.

Introduction:

Herbal Medicine is the oldest form of medicine known to mankind. It was the mainstay of many early civilizations and still the most widely practiced form of medicine in the world today,

Ethnobotany is one of the most interesting themes of economic botany which might have first of all came into the existence probably when earliest man of "stone age" observed the animals mostly the apes and monkeys eating certain plants or plant parts viz., Fruits, leaves and even inflorescences to satisfy their hunger. Therefore, on the basis of plants usage first of all by animals and later on by the human beings the concepts of Ethnobotany and Ethnozoology were evolved, which merged into a common term known as Ethnobiology. However, the term Ethnobotany was first of all used in the last of 19th century by J.W. Harsh Berger (1895)

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to indicate the interrelationship of plants with aboriginal people or tribal societies [Trivedi and Sharma, 2011]. In many parts of the world, wild plants are obtained from forests or wild areas designated for extractive resources and managed by local communities [Jadhav et al., 2011]. Wild edible plants provide food quantity as well as medicines [Patale et al., 2015].

India is one of the twelve mega-biodiversity countries of the World having rich vegetation with a wide variety of plants. As per the 2001 census, the tribal population of India is 8.43 crore, constituting 8.2% of total population of the country [Annual Report, 2005–2006]. With enormously diversified ethnic groups and rich biological resources, India represents one of the great emporia of ethnobotanical wealth [Pal, 2000]. Even today, tribal's and certain local communities in India still collecting and preserving locally available wild and cultivated plant species for their day today life [Mahishi et al., 2005 and Ayyanar et al., 2010].

We were presented a book written by Dr. M.I.H. Farooqi entitled "Quruani Poudhe-Vagayanic Dhristi Se" while in Seminar organised by UP Biodiversity Board, Lucknow. We found that there are seventy-one plants being reported in Holy Qur'an and Bible. We have consulted the literatures available as well as the tribal of Bahraich about the uses of the plants available. The perusal of the alphabetical list of plants of Holy Qur'an reveals that there are 71 plant species representing 48 genera of 30 families. *Brassicaceae, Cucurbitaceae* and *Moraceae* family were found to be the biggest family represented by 6 plant species each whereas *Caesalpiniaceae, Papilionoideae* and *Poaceae* with 5 plant species each; *Rosaceae* and *Rhamnaceae* with 4 plant apecies; *Mimosaceae, Liliaceae, Pinaceae, Euphorbiaceae, Oleaceae, Lytharaceae, Lamiaceae* and *Arecaceae* with 2 plant species and rest fourteen families viz., *Malvaceae, Asclepidiaceae, Lauraceae, Bixaceae, Dipterocarpaceae, Juglandaceae, Cuprassaceae, Lecnoraceae, Loranthaceae, Anacardiaceae, Sterculiaceae, Ericaceae, Salvadoraceae,* and *Vitaceae* is being represented by single plant species each. We have enumerated five plants viz., *Acacia nilotica, Acacia senegal, Acacia seyal, Alhgi maurorum* and *Allium cepa* in detail in first part and eight plants viz., *Allium sativum, Astragaluh adscendens, Bombax ceiba, Brassica arabica, Brassica juncea, Brassica nigra, Brassica rapa* and *Brassica schimperi* in second part of the manuscript. In present third part of the manuscript we are eneumerating seven plants viz., *Butea monosperma, Calotropis gigantean, Cedrus libani, Cedrus deodara, Ceratonia siliqua, Cinnamomum camphora* and *Citrullus colocunthis.*

Eneumerations

Butea monosperma (Lam.) Taub. Flame of the Forest, bastard teak, battle of Plassey tree, Bengal kino, palas tree, parrot tree

- Assamese: bipornok, kingxuk, polax
- Bengali: palash
- Gujarati: kesudo, khakhro, palash
- Hindi: dhak, palash, tesu
- Kannada: muttuga, palasha
- Konkani: palas
- Malayalam: chamata, kinsukam, plaas
- Manipuri: pangong
- Marathi: dhak, palas
- Nepali: palans
- Oriya: palasha
- Sanskrit: kimshuka, palasha
- Tamil: kincukam, palasam
- Telugu: kimsukamu, (Fabaceae)

Synonyms

Butea braamania DC.; *Butea frondosa* Roxb.; *Butea frondosa* Willd.; *Butea frondosa var. lutea* (Witt.) Maheshw.; *Erythrina monosperma* Lam.; *Plasomonosperma* (Lam.) Kuntze; *Plasomonosperma var. flava* Kuntze; *Plasomonosperma var. rubra* Kuntze; *Rudolphia frondosa* (Willd.) Poir.

Butea monosperma is found throughout the drier parts of India, often gregarious in forests, open grasslands and wastelands. A characteristic tree of the plains, it often forms pure patches in grazing grounds and other open places [World Agroforestry Centre, 1977].

Butea monosperma is a species of *Butea* native to tropical and sub-tropical parts of the Indian Subcontinent and Southeast Asia, ranging across India, Bangladesh, Nepal, Sri Lanka, Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, and western Indonesia.

It is native to India, flame of the Forest, a Sacred Tree, is a medium sized tree, growing from 20 to 40 feet high, and the trunk is usually crooked and twisted with irregular branches and rough, grey bark. The leaves are pinnate, with an 8–16 cm petiole and three leaflets, each leaflet 10–20 cm long. The hindi phrase "Dhaak ke teen paat" comes from

the prominent three leaflets of this tree. It is seen in all its ugliness in December and January when most of the leaves fall: but from January to March it truly becomes a tree of flame, a riot of orange and vermilion flowers covering the entire crown. These flowers, which are scentless, are massed along the ends of the stalks–dark velvety green like the cup-shaped calices and the brilliance of the stiff, bright flowers is shown off to perfection by this deep, contrasting colour. Each flower consists of five petals comprising one standard, two smaller wings and a very curved beak-shaped keel. It is this keel which gives it the name of Parrot Tree. In olden days, the flowers of Tesu were used to make color for the festival of Holi. In Manipur, there is an interesting cultural use of the wood of this tree with beautiful flowers– when a member of the Meitei community dies and, for some reasons, his body can not be found, the wood of this tree is cremated in place of the body.

A postal stamp was issued by the Indian Postal Department to commemorate this flower.

Ethnobotanical Potential

Young roots are consumed [Digital Compendium of Forestry Species of Cambodia, 2008].

Butea monosperma (Lam.) is a tree with a purpose: Improving livelihood of disadvantaged rural people of central India [Sridhar et al., 2015].

Ethnomedicinal Potential

Butea gum, or Bengal kino, an exudate from the tannin-rich vesicles in the bark, is used medicinally [Mansfeld's Database of Agricultural and Horticultural Plants; Brummitt & Powell, 1992].

A powerful astringent, it is used in the treatment of diarrhoea and wounds [World Agroforestry Centre Publication; Digital Compendium of Forestry Species of Cambodia, 2008].

The seeds, ground into a paste with honey, are used for anthelmintic, antifungal, antibacterial and purgative properties [World Agroforestry Centre Publication, 1977; Plant Resources of Southeast Asia Publication PROSEA, 2003; Allen and Allen, 1981].

The seed paste, mixed with lemon juice, are used as a rubefacient [Allen and Allen,1981].

The seeds contain around 18% oil. Called 'moodoga oil', it is an effective treatment for hookworms [Watt., 1883; Allen and Allen, 1981].

The flowers and leaves are aphrodisiac, astringent and diuretic [Allen and Allen, 1981].

The flowers are useful in the treatment of liver disorders [World Agroforestry Centre Publication, 1977].

The flowers contain butrin and isobutrin. These compounds have been shown to have antihepatotoxic principles [Plant Resources of Southeast Asia Publication PROSEA, 2003].

The seeds act as an anthelmintic [World Agroforestry Centre Publication, 1977].

A potential anti-asthmatic agent has been reported from the bark [Plant Resources of Southeast Asia Publication].

Agroforestry Uses

Seedlings and green branches are spread in rice fields as a salt-filtering agent and green manure. Leaf-decomposing bacteria produce a slime that is able to aggregate clay particles. In the course of this process micro-cavities are formed loosening the compacted soil and allowing leaching of noxious salts from the soil solution [Digital Compendium of Forestry Species of Cambodia, 2008].

In India, farmers frequently use this tree to stabilize field bunds [World Agroforestry Centre Publication, 1977].

As per study of Sridhar et al. (29) the lac cultivation on *Butea monosperma*-based agroforestry is quite helpful for livelihood security in drought-prone regions of Central India and a single tree of *Butea monosperma* can produce 1.5–2.5 kg and gives an annual income of ₹700/– to ₹800/–. An apiculture-based agroforestry system is another option which will not only provide additional income to the farmers, but will also result in other benefits to the agricultural production due to the role of honeybees as pollinators.

Other Uses

The flowers are used for the preparation of a yellow dye for silk especially, also ritually used [Mansfeld's Database of Agricultural and Horticultural Plants (Brummitt & Powell, 1992)].

A bright yellow to deep orange-red dye, known as butein, can be prepared from the flowers. It is used especially for dyeing silk and sometimes for cotton, and is traditionally used by Hindus to mark the forehead [World Agroforestry Centre Publication, 1977]. The colour is, however, fleeting, but it may be made less so by using alum or lime as a mordant, which also deepens the colour [Watt.,

1883]. Sometimes myrabolans are used for this purpose, or the dye is combined with anatta (*Bixa orellana*) [Watt, 1883].

A red dye is obtained from the roots [Digital Compendium of Forestry Species of Cambodia, 2008].

The bark is a source of tannins [World Agroforestry Centre Publication, 1977].

A red exudate is obtained from the tannin-rich vesicles in the bark [World Agroforestry Centre Publication, 1977; Mansfeld's Database of Agricultural and Horticultural Plants; Brummitt & Powell, 1992]. It hardens into a gum, known as Butea gum, or Bengal kino and can be used medicinally, as a dye or for tannin [World Agroforestry Centre Publication, 1977; Mansfeld's Database of Agricultural and Horticultural Plants; Brummitt & Powell, 1992; Watt, 1883]. It occurs in the form of round tears, often fragmentary. It may be purified by solution in water. It is of a brilliant ruby-red colour, translucent and brittle, heat rendering it more so instead of melting it [Watt, 1883].

A small quantity of a bright, clear oil is obtained from the seeds [World Agroforestry Centre Publication, 1977; Mansfeld's Database of Agricultural and Horticultural Plants; Brummitt & Powell, 1992; Watt, 1883]. The seeds contain up to 18% oil [Allen and Allen, 1981].

A course, tough, fibrous material, known as 'pala fibre' is obtained from the inner bark. It is used for cordage, caulking the seams of boats and making paper [World Agroforestry Centre Publication, 1977; Digital Compendium of Forestry Species of Cambodia, 2008; Dodge, 1897; Allen and Allen, 1981].

A strong fibre, obtained from the roots, is used in India for making native sandals, ropes etc. [Watt., 1883; Dodge, 1897].

The soft and not durable wood is light, white or yellowish-brown when fresh, but often turning greyish because of susceptibility to sap stain. It is not of great value but is sometimes used for utensils [World Agroforestry Centre Publication, 1977].

The wood is durable under water and is used to make well curbs, water dippers, sacred utensils etc. [Allen and Allen, 1981].

The wood makes a fuel of moderate quality [World Agroforestry Centre Publication, 1977]. The leaves are sometimes used as a fuel [World Agroforestry Centre Publication, 1977]. The wood is burnt for gunpowder charcoal [World Agroforestry Centre Publication, 1977].

Propagation

Seed–sow in situ [World Agroforestry Centre Publication, 1977]. Germination, which starts in about 10–12 days, is completed in 4 weeks [World Agroforestry Centre Publication, 1977]. Fresh seeds have a good germinative capacity (about 63%) at optimum germination temperature of about 30°C [World Agroforestry Centre Publication, 1977]. While germinating in the wild, the seed remains in the pod which opens at the tip and allows the young shoot and root to emerge [Plant Resources of Southeast Asia Publication PROSEA, 2003]. The cotyledons remain attached to the seedling for a considerable time [Plant Resources of Southeast Asia Publication PROSEA, 2003].

Root suckers and Air layering.

Calotropis gigantea (L.) Aiton Madar, Giant Milkweed (Apocynaceae)

Common Names

Bengali Aakanda; English Crown Flower, Giant Milk Weed, Milkweed, Bowstring hemp, Giant Calotrope, Hindi Arka, Mudar, Ak, Safed Aak; Malayalam Erikku, Chuvannaerikk, Yerikku, Vellerikk, Erikkalachedi, Vella-erikku, Dinesam; Manipuri Angkot; Marathi Arki, Ruiti, Arka, Rui; Others Crown Flower, Milkweed, Giant Calotrope, Swallow-wort, Yerukku, Bowstring Hemp, Giant Milkweed, Mandar; Sanskrit Hrasvagnih, Sadapushpa, Arka, Alarka, Arki; Tamil Arkkam, Erukku, Malaiyerukku, Yerukku; Telugu JilledíPuvvu, Jilledu, Uchchinta, Nallajilledu, Uccinta**.**

Synanyms

Asclepias gigantea L.; *Madorius giganteus* (L.) Kuntze; *Periploca chinensis* Decne.; *Periplocacochin chinensis* Lour.; *Streptocauloncochin chinense* (Lour.) *G. Don* Shrubs, stem rounded. Leaves 10–16 × 8–10 cm, smaller in branchlets; elliptic-ovate to obovate, apex acute or obtuse, base cordate; lateral nerves 5–7 pairs, ad pressed pubescent when young, becoming glabrous on maturity. Flowers pale purple or greenish-white, 3 cm across; pedicels to 3 cm long, stout; calyx lobes to 3 mm long; corolla campanulate, tube short, lobes ovate to oblong, recurved; staminal corona of 5 vertical lobes, 1 cm long. Fruit saccate, to 6 × 3 cm, ovoid; seeds many. Flowering and fruiting: throughout the year.

Flower- In terminal or lateral panicles, purple or lilac or dull white. Flowering throughout the year. Fruit–A follicle, Oblong, in flattened; seeds oblong to ovate, ending in a silky coma. Fruiting

throughout the year. Field tips– Leaves sessile, auriculate at base, densely white powdery.

It is common in East Asia–Southern China, Indian subcontinent, Myanmar, Thailand, Laos, Vietnam, Malaysia, Indonesia.

Dry coastal areas, along the sheltered shores of lagoons, overgrazed pasture land [Barwick, 2004]. Woods of dry areas, stream banks from sea level to 1,400 metres in southern China [Flora of China, 1994].

Succeeds in the drier tropics. Most commonly found in areas of the tropics with a specific dry season, at elevations up to 1,000 metres [Protabase, 2004]. An excellent plant for the seaside garden [Barwick, 2004].

Prefers a well-drained soil in a sunny position [Whistler and Arther, 2000]. Succeeds in a variety of soils, but prefers littoral, sandy soils [Protabase, 2004]. Plants can thrive in dry sands [Dodge, 1897]. Established plants are very drought tolerant [Barwick, 2004]. Plants are tolerant of salt-laden winds [Barwick, 2004].

One hectare of ground stocked with plants 30 cm apart can yield 24 tonnes of green stems, from which 260–350 kilos of fibre can be obtained [Dodge,1897]. The plant is of great religious significance in India, where it is sacred to the God Shiva [Dodge, 1897]. Plants can flower all year round, but the main flowering is in the hot season [Protabase, 2004].

The sap (latex) is somewhat poisonous [Whistler and Arther, 2000]. It is used for poisoning arrows [Protabase, 2004].

All parts of the plant are toxic, due to the presence of several cardiac glycosides [Protabase, 2004].

The plant is also known to cause allergic contact dermatitis, and the latex causes kerato-conjunctivitis [Protabase, 2004].

Ethnobotanical Potential

The central part of the flower is candied and used as a sweetmeat [Uphof,1959]. A fine fibre is obtained from the bark of the stems [Flora of China 1994; Whistler and Arther, 2000; Dodge, 1897]. Very strong, it is said to possess many of the qualities of flax (Linumusitatissimum), though it is somewhat finer [Uphof, 1959; Dodge, 1897].

It is much used for making textiles, fishing nets and bow strings [Dodge, 1897]. The mature seed pods contain a large quantity of floss, which has a variety of uses. For example, it can be used to stuff pillows etc or mixed with other fibres to make cloth [Whiting, 1943; McPherson, 1977; Buchanan, 1987; Hill, 1952; Dodge, 1897]. It is a Kapok substitute, being very water repellent, it can be used as a buoyancy aid in Life Jackets or as a stuffing material [Whiting, 1943].

The floss absorbs oil whilst repelling water and so has also been used to mop up oil spills at sea. Candlewicks can be made from the seed floss [Whiting, 1943; Coffey,1993]. The twigs are used as chew sticks for cleaning the teeth [Protabase, 2004; Dodge, 1897].

The juice is used in making a yellow dye and in tanning [Flora of China, 1994]. The wood is sometimes used for fuel, but it is of poor quality [Protabase, 2004].

However, a good quality charcoal is obtained from the wood and can be used for making gunpowder [Manandhar, 2002; Protabase, 2004; Dodge, 1897].

Ethnomedicinal Potential

The milky sap (latex) coagulates when warm and is said to have similar cardiac properties to digitalis (from various *Digitalis* spp.) [Dodge, 1897].

It is also considered to be antiseptic, emetic, purgative and vermifuge [Protabase, 2004]. It is used in the treatment of a variety of other conditions including dysentery, leprosy, elephantiasis, epilepsy, asthma and many other complaints [Dodge, 1897].

Mixed with salt, it is taken orally as an emetic for treating severe colds[de Filipps, et al., 2004]. In Nepal, the latex is applied to sprains, body pains, boils and pimples [Manandhar, 2002].

The milky latex is used externally to stop bleeding, and for treating a wide range of conditions including leprosy, rheumatism, ringworm, boils, scabies, stings, burns, bruises, cuts, sores and wounds, [Protabase, 2004; de Filipps, et al., 2004]. It is applied to the gums and teeth to treat caries and toothaches [Protabase, 2004].

The bark is used as a medicine for the treatment of neurodermatitis and syphilis [Flora of China, 1994]. The powdered bark is used to treat diarrhoea, dysentery, elephantiasis, and leprosy [Manandhar, 2002; Protabase, 2004].

The stem bark is diaphoretic and expectorant, and is used for dysentery, spleen complaints, convulsions, lumbago, scabies, ringworm, pneumonia, and to induce labour.

An infusion of the leaves is used to treat severe chest colds and heart conditions [de Filipps, et al., 2004]. The leaf juice is used in the treatment of

intermittent fever [Manandhar, 2002]. The smoke of dried, burned leaves is inhaled to calm asthma attacks [Protabase, 2004].

The crushed leaves are warmed and used as a poultice on sores, burns, headaches and rheumaticpains [Uphof, 1959; Flora of China, 1994; Manandhar, 2002; Protabase, 2004]. The powdered flowers are valued for treating coughs, colds and asthma [Manandhar, 2002; Protabase, 2004]. An infusion is taken to treat intestinal worms, rheumatism and epileptic attacks [Protabase, 2004].

The juice of young buds is dropped into the ear in the treatment of earache [Manandhar, 2002]. The fruit pulp is considered abortive [Protabase, 2004]. Roots and flowers are being used against dog bites [Murtem and Chaudhry, 2019].

Agroforestry Uses

As it thrives upon soils where nothing else will grow, needing neither culture nor water, it has been considered a good plant for bringing waste land under tillage and for reclaiming drifting sands [Dodge,1897]. The leaves can be used for mulching, green manuring of rice fields and for binding sandy soil[Protabase, 2004]. The plant is sometimes grown as a hedge [Protabase, 2004].

Cedrus libani A. Rich. 1823 Lebanese cedar, cedar of Lebanon (Vidakovic, 1991)(Pinaceae):

Synanyms

C. libanotica Link; *C. libanitica* (Trew) Pilger; *C. libanensis*Juss. ex Mirb.; *C. cedrus* Huth.; *C. patula* K. Koch (Vidakovic, 1991). Author cited as Loud. in (Vidakovic, 1991).

Cedrus libani, commonly known as the cedar of Lebanon or Lebanon cedar, is a species of cedar native to the mountains of the Eastern Mediterranean basin. It is an evergreen conifer that can reach 40 m in height. It is the national emblem of Lebanon and is widely used as an ornamental tree in parks and garden. Native to mountains near the Mediterranean in Turkey, Syria and Lebanon. In Turkey, occurs from the western Taurus Mountains, east to the province of Hayat; there are also two occurrences near the Black Sea; the area of occupancy is about 993 km^2. In Syria, occurs at one location on the eastern side of Jabal An–Nusayriya, with an area of occupancy of only 1.5 km^2. In Lebanon, occurs along the Mount Lebanon chain with an area of occupancy of 22 km^2. Only some of the Taurus Mountains stands can be described as healthy, intact forest; through its remaining range, the forests are fragmented and degraded by factors of decline that include grazing, logging, urbanization, winter sports, and insect pests [Gardner, 2015].

Cedruslibani occurs at elevations of 1,300–3,000 m, usually on N and W aspects on well-drained, mainly calcareous souls. Climate is cool with abundant winter snow at higher elevations. Typically, in pure stands or with *Abiescilicica*, *Juniperusexcelsa*, *J. oxycedrus*, *Pinus nigra, P. brutia*, and hardwood species such as *Quercus cerris*, *Sorbus torminalis*, and *Prunus ursina* [Gardner, 2015].

Hardy to Zone 7 (cold hardiness limit between –17.7°C and –12.2°C) [Bannister and Neuner, 2001].

This may be the conifer with which humans have the longest recorded history. "Through five millenniums of recorded history, a parade of civilizations has praised the cedars of Lebanonand then chopped them down. Lebanon has been deforested by Mesopotamians, Phoenicians and ancient Egyptians; by the Greek and Roman empires; by crusaders, colonizers and modern Middle East turmoil" [Barnard and Haner, 2018]. The cedar is mentioned often in the Old Testament of the Bible. For example, the First Temple of Solomon was built of it. In modern times, Cedar of Lebanon is widely cultivated as an ornamental species.

Masri (1995) provides this summary of the species historical importance: The Cedar of Lebanon is cited numerous times in religion and mythology. In addition to its significant role in the Epic of Gilgamesh, the Cedar of Lebanon is regarded as a world tree in several mythological passages. One deeply mythological passage sees the imperial nation, the embodiment of history, under the figure of something like a world-tree [Ezekiel 31.1–18]. The cutting of the cedar is seen as the destruction of world-empires-really, as the end of history. Our understanding of ecology, the dependence of human history on maintenance of the natural environment, simply makes this primitive insight explicit.

Ethnobotanical Potential

The sawdust of the cedar puts snakes to flight, and thus makes sleeping under the shade of a cedar a relatively safe siesta. Furthermore, based upon historical analyses, it is believed that the cedar was used in the preservation of the corpses in Egypt.

The Cedar of Lebanon aided society not only culturally but was the basis of numerous economies for ancient civilizations. The cedar had been used for the construction of temples, palaces, and boats. The export of cedar wood to Egypt was an important factor in the growth of Phoenician prosperity and

provided capital to launch the more ambitious enterprises in international trading, navigation, and arts and crafts.

The Phoenicians and the Egyptians were not alone in utilizing the cedar. The Assyrians, Nebuchadnezzar, the Romans, King David, King of Babylonia, Herod the Great, and the Turks in the Ottoman Empire all exploited the cedars. During the War of 1914–1918, most of the remaining stands were exploited and destroyed for railroad fuel. As a consequence, the extent of the cedars in Lebanon has dramatically declined.

The latest, and perhaps most severe human threat to the cedars is climate change, which "could wipe out most of the country's remaining cedar forests by the end of the century" [Barnard and Haner, 2018]. There are a variety of factors at play here, familiar in climate change effects on forests around the world: increasing temperature, increasing aridity, increasing fire risk, and proliferation of pest insects are foremost among them. But the principal concern in Lebanon is that the trees have no place to go; they are already growing on the mountaintops. They cannot migrate upwards to more hospitable environments.

The Taurus Mountains are said to have the best remaining wild stands of this species, but that is largely due to its occurrence in remote and inaccessible locations. Gardner (2015) notes that "there are extensive forests occurring from Boz Mountain (Acipayam) in the west and Ahir and Nur (Amanos) mountains in the east," but I have no more specific location information. Barnard and Haner (2018) note that significant extant stands include the Barouk Cedar Forest (part of the Shouf Biosphere Reserve, south of Beirut), and the Tannourine Cedars Forest Nature Reserve.

The Horsh Ehden nature preserve in Lebanon looks to be a very worthwhile place to visit and see this species [Fareed, 1999]. The Cedars of Bsharre in Lebanon, now in a World Heritage Site, formerly included some remarkably large trees [Gardner, 2015]. The species is an extremely popular ornamental in Europe and North America, and is almost universal in arboreta and botanical gardens of the temperate zone.

Ethnomedicinal Potential

Medicinally, the Cedar of Lebanon also made its mark. The pitch of the cedar was utilized for easing the pain of toothaches.

Uses of medicinal tars

The most frequent uses mentioned by herbalist and producers were against different hair and skin problems like dandruff, eczema, itchiness and skin infections.

It is also used to decorate pottery and to give water a pleasant odour. In rural areas Gatran is sometimes added to drinking water as a disinfectant to improve the quality.

Other important uses are for animals as a treatment against intestinal parasites and as a repellent towards snakes and scorpions.

Ferraga, the traditional women healers, use Gatran when healing small babies [Julin, 2008]. It is used in medicine as ananalgesic, disinfectant and towards different skin diseases like psoriasis and dandruff [Anon, 2001]. It is also used in cosmetics like soaps and shampoo, both for its disinfectant properties and as a perfume [FAO, 1998].

Literature sources [Bellakhdar, 1998] indicate that medicinal tars, like Cade oil, in Morocco are made from different conifer species like *J. phoenicea, J. thurifera, Cedrus atlantica* or *Tetraclinis articulate.*

Cedrus deodara (Roxb. ex D. Don) G. Don 1830, Deodar cedar, Himalayan cedar, deodar, devdar, devadar, devadaru (Pinaceae):

Synanyms

Cedrus indica Chambray; Cedrus libani var. *deodara* Hook. (Vidakovic, 1991).

Cedrus deodara, is a species of cedar native to the western Himalayas in Eastern Afghanistan, Northern Pakistan and India, Southwestern Tibet and Western Nepal, occurring at 1,500–3,200 m altitude. Deodar forests are forests dominated by *Cedrusdeodara* and are found in Western Himalayas from Gandak river in central Nepal to Hindukush in Afghanistan.

A tree up to 50 m high and up to 3 m in diameter. Crown conical when young, with drooping leader and branches drooping at the end, older trees rounded. Branches horizontally arranged, and end of the shoots pendulous. One-year shoots densely pubescent. Needles blue-green, about 30 in a cluster, 3–5 cm long, acuminate. Flowers appear in September and October. Cones solitary or in pairs. ovate or barrel-shaped. 7–10 cm long, 5–6 cm wide, rounded at the apex, bluish when young, reddish-brown when ripe; maturing from September to November; the seed is shed from September to December; seed scales 5–6 cm wide,

usually glabrous on the upper side. Seed about 17 mm long, about 6 mm wide; wing large, light brown [Vidakovic, 1991].

The best trees are found on deep, well-drained soils. High atmospheric moisture is favourable. It is tolerant to shade, but young trees are prone to injury from frosts and cold wind [Vidakovic, 1991]. It is a component of the temperate forest, usually on north-facing valley slopes, where rainfall ranges from less than 1000 mm per year up to 2500 mm per year, mostly in the form of winter snow. In these forests *C. deodara* is associated with a wide array of conifers and some broadleaf trees. Species present may include *Pinus wallichiana*, *Taxus baccata*, *Picea smithiana, Abies spectabilis*, and *Abies pindrow*, as well as species of *Quercus, Rhododendron*, *Acer, Corylus, Aesculus and Betula*. At somewhat lower and drier (precipitation less than 1000 mm/year, mostly as snow) elevations it commonly occurs with *Pinus gerardiana*, *Quercus ilex* and *Juniperus excelsa* subsp. *polycarpos* [Bhattacharyya et al., 1988]. Hardy to Zone 8 (cold hardiness limit between –12.1°C and –6.7°C) [Bannister and Neuner, 2001].

Ethnobotanical Potential

It is an important timber tree in India. In the West, is widely planted as an ornamental in Europe [Vidakovic, 1991] and the Western United States. It provides an excellent fuelwood. Timber: The wood is white to light yellowish brown, with a characteristic odour and oily feel. It is straight-grained, medium fine and somewhat uneven-textured. Its average weight is 560 kg/m^3. The heartwood is very durable but insects and fungi attack sapwood. Deodar is an important structural timber tree. Its wood is highly valuable and extensively used for building, railway sleepers, carriage and railway wagon work and other purposes for which durabilityis required. It is used in house building, beams, floorboards, door and window frames, furniture and general carpentry. Italso produces quality plywood [Orwa et al., 2009].

Other products

It is a possible substitute of pines as a Christmas tree.

Ethnomedicinal Potential

The use of *Cedrus deodara* in Ayurvedic medicines is well known. The plant yields a medicinal essential oil by distillation of the wood which is used for treatment of a wide range of ailments from fevers and dysentery, bronchitis, and snake bites. A resin obtained from the wood is used externally to treat bruises, skin diseases and injuries to joints.

The leaves are used in the treatment of tuberculosis.

Oil obtained from the seed is applied externally to treat skin diseases. The essential oil is used as insect repellent on the feet of horses, cattle and camels.

It also has anti-fungal properties and has some potential for control of fungal deterioration of spices during storage.

Due to its anti-fungal and insect repellent properties, rooms made of *Cedrus deodara* wood are used to store meat and food grains like oats and wheat in Himachal Pradesh.

In Himachal people suffering from asthma or other respiratory problems are advised to sit under a Deodar tree early in the morning.

Cedar oil is often used for its aromatic properties, especially in aromatherapy. Its applications cover soap perfumes, household sprays, floor polishes and insecticides. It is also used in microscope work as a clearing oil [Trees in KKL-JNF Forests].

Services

Erosion control: It's a soil conservation and erosion control species in the Himalayas.

Shade or shelter: Its shelter woods increases dry land pasture productivity as in New Zealand.

Reclamation: It's a good re-vegetation species [Orwa et al., 2009].

Ornamental: This species is grown as an ornamental and in amenity plantations in its native range and many countries into which it was introduced.

Ceratoniasiliqua Linn. Carob, carobtree, locust bean, St John's bread (Fabaceae):

The carob tree, *Ceratonia siliqua* L., is an evergreen shrub or tree cultivated in the Mediterranean area for its sugar-rich pods and gum-containing seeds. It reaches a height of 8–17 m in the wild but cultivated trees are smaller. It has a broad hemispherical crown, a thick trunk and sturdy branches [Ecocrop, 2011; Battle and Tous, 1997]. The carob tree has an extensive root system with a deep taproot and lateral roots. Its leaves are alternate, pinnate, with or without terminal leaflets, and 10–20 cm long. The dark green leaflets have a very thick epidermis containing large amounts of tannins [Shepperd, 2008]. Each tree bears both female and male, or hermaphroditic, flowers (some cultivars may be completely hermaphroditic): plantations should comprise about 12% of pollinators

(male or hermaphroditic trees) [Battle and Tous, 1997; Göhl, 1982]. The small and numerous flowers are borne in clusters that grow directly along the branches [Battle and Tous, 1997]. The fruit is an indehiscent straight or curved pod, 10–30 cm long, 1.5–3.5 cm broad and 6–20 mm thick. The pods have a wrinkled surface that turns dark brown and leathery at maturation. They contain 5 to 18 hard brown seeds (10% of the pod weight) embedded in a sweet thick pulpy substance [Shepperd, 2008; Battle and Tous, 1997]. The seeds, all being the same size, are used as weights in eastern Mediterranean countries: the word "carat" comes from qīrān, the Arabic name of the seeds [Göhl, 1982].

The carob tree is native to the Mediterranean region, including Southern Europe, Northern Africa, the larger Mediterranean islands, the Levant and Middle-East of Western Asia into Iran, and the Canary Islands and Macaronesia in the Atlantic Ocean.

Ethnobotanical Potential

The carob tree is a very useful resource.

Traditionally, carob pulp has been used for food: roasted and eaten as a snack, roasted and ground to make a cocoa substitute, fermented to make alcohol, or diluted to make carob syrup [Battle and Tous, 1997]. The pods themselves are used as a famine food, as the tree survives and keeps fruiting during periods of scarcity [Freedman, 2009].

The most important industrial carob product today is the carob gum, a galactomannan extracted from the seeds, which is a common food thickener and stabilizer. Feed products derived from the carob trees are the whole ground pods which can be fed to ruminants and non-ruminants, the dried, deseeded sugar-rich pulp, and the carob germ meal (the by-product of gum extraction). Carob leaves are relished by browsing livestock [Battle and Tous, 1997]. The ripe, dried, and sometimes toasted pod is often ground into carob powder, which is sometimes used to replace cocoa powder. Carob bars, an alternative to chocolate bars, as well as carob treats, are often available in health food stores. Carob pods are naturally sweet, not bitter, and contain no theobromine or caffeine.

Carob trees also provide a wood used for making utensils and slow-burning charcoal (Shepperd, 2008) and extracted to yield algarrobin, a textile dyeing agent [Morton, 1987].

Carob trees are used as an ornamental evergreen species and are helpful in afforestation [Battle and Taus, 1997].

Environmental impact

It is nitrogen fixing legume. Carob was long believed to be unable to fix nitrogen, but bacteria thought to belong to the *Rhizobium* genus have been isolated from carob root nodules [El Idrissi et al., 1996]. It is being used in agricultural diversification, afforestation and soil erosion control. Carob trees may also be helpful in degraded areas threatened by soil erosion and desertification [Battle and Tous, 1997].

Other environmental services

Carob trees are used as windbreaks around orchards. Because of their dense foliage, they are also helpful buffers against noise from factories, roads and railways [Battle and Tous, 1997]. is widely cultivated for its edible pods, and as an ornamental tree in gardens and landscapes. The carat, a unit of mass for gemstones, and a measurement of purity for gold, takes its name from the Greek word for a carob seed, keration, via the Arabic word, qīrān.

Products

Food: Carob pulp is high in total sugar content (48–56%). In addition, it contains about 18% cellulose and hemicellulose. Mineral composition consists of potassium, calcium, magnesium, sodium, iron, copper, iron, manganeseand zinc.

In some countries, Egypt for example, carob syrup is a popular drink, obtained from carob kibbles with water. Unicellular organisms convert carob pulp into a high-protein feed; sugar solutions extracted from carob pods are an excellentsubstrate for culturing fungi such as *Aspergillus niger* and *Fusarium monoliforme*, and the dried mycelium is a palatableand nutritious feed, containing up to 38% crude protein by weight. The carob product most widely used, especially inthe food industry, is carob bean gum (CBG), or locust bean gum (LBG). This gum comes from the seed endosperm and chemically is a polysaccharide, a galactomnnan. 100 kg of seeds yield 20 kg on average of pure dry gum.

The mucilaginous gum, known as 'tragasol', is used in a wide range of commercial products as a thickener, stabilizer, binder and gelling or dispersal agent. The food industry uses CBG for the production of a large number of different commodities: ice cream, soups, sauces, cheese, fruit pies, canned meats, confectionery, bakery products and petfoods. Technical applications of CBG include cosmetics, pharmaceuticals, film emulsions, paints, polishes, ceramicsand adhesives.

Pulp extracted and purified produces sugar and molasses. Powdered pulp is used as a food ingredient and cacaosubstitute and for preparing dietary products. Carob powder consists of 46% sugar, 7% protein and small amounts of numerous minerals and vitamins and is thus quite nutritious. Carob 'cocoa' has an advantage over chocolate in that ithas fewer calories and neither caffeine nor theobromine. Ground seed embryo and endosperm can be used for human consumption; the latter, containing CBG and E-410, is a food additive and a dietary fibre.

Fodder: C. siliqua pods provide fodder for ruminants and non-ruminants. Endosperm and embryo of the seed can beground and used for pet food. The fodder is now being used in zero-grazing in Mediterranean countries.

Fuel: The wood produces a slow-burning charcoal and can also be used for firewood.

Timber: C. siliqua timber is hard and close-grained and has been used to make utensils.

Gum or resin: Currently, the main use of the seed is gum extraction.

Tannin or dyestuff: Ripe carob pods contain large amounts of condensed tannins (16–20% of dry weight).

Alcohol: A high sugar content and its relatively low cost have made carob pulp among the earliest horticultural cropsused for the producton of industrial alcohol by fermentation in several Mediterranean countries.

Services

Shade or shelter

Widely planted as a shade tree, also recommended as a windbreak around orchards.

Reclamation

Since it requires little if any cultivation, tolerates poor soils and is long lived, *C. siliqua* is often recommended for reforestation of degraded coastal zones threatened by soil erosion and desertification.

Ornamental

A popular ornamental in California, Australia and elsewhere; male trees are preferred as they do not provide litter from pod fall. However, the value of *C. siliqua* as a drought-tolerant, air-pollution tolerant, low maintenance tree for street landscape planting could be limited by its large size when mature and its strong, invasive roots.

Intercropping

Frequently planted with species such as olive, grapevines or almond. Young *C. siliqua* orchards are intercropped with early-bearing species such as peach, almond or even vegetables; an annual perennial crop between the rows may give early returns to the investment.

Pollution

Ceratonia siliqua could help buffer noise from factories, roads and railways because of its dense foliage.

Ethnomedicinal Potential

Carob (*Ceratonia siliqua*) is one of the important crops over Western Asia and North Africa. Its nutritional value has been acknowledged for millennia but its medicinal properties were practically studied only in the last four decades, despite the fact that someof them were used in traditional medicines for centuries. Modern food industry is just starting to discover the great potential of this plant. Carob has outstanding antioxidant capacity along with other important medicinal activities. Some of these have been extensively studied and reported in the last decades, but very few review articles were published about this plant, that summarize and discuss the findings [Azab, 2017].

Medicine: Tannins extracted from the pulp act as an anti-diarrhoeic. Ground pulp and seed endosperm are used in thepreparation of pharmaceutical products.

The medicinal uses of this plant are diversified in different regions viz., in Cyprus it is used as laxative [Ozkum et al., 2013]; in Egypt it is used in diarrhoea through infusion [Abouzid and Mohamed, 2011]; in Greco-Arab it is used in diabetes, herpes and lip sore through leaf decoction [Saad and Said, 2011]; in India it is used as an ant obesity [Fatima et al., 2017]; in Iran it is being used in menorrhagia where the patient has to sit in a container of a decoction of several plants including Carob [Tansaz et al., 2016]; in Iraq abdominal pain and diarrhoea is being cured by eating ripe fruits [Ahmed, 2016]; in Israel it is being used as antidiabetic by leaf decoction [Said et al., 2002] and against viral and bacterial infections and fevers are cured by fruit syrup mixed with sesame paste [Landau et al., 2014]; in Italy dry fruits are given as an animal food [Guarrera et al., 2016] and as an cure for emollient through fruits decoction

with *Ficus carica* and *Malva sylvestris* [Montesano et al., 2012]; in Jordan it is being used as an antidiabetic through consumption of leaves decocition [Afifi-Yazar et al., 2011] and cough is cured through hot/cold infusion of fruits [Oran and Al-Eisawi, 2015]; in Lebanon molasses of ripe fruits is used as sweetener [Baydounet al., 2015] and also used as medicinal [Baydoun et al., 2017]; in Morocco fruit, bark, and leaves are used in diarrhoea, to kill fish during fishing [Ennabili et al., 2000] to kill intestinal parasites through use of fruits/leaves decoction [El-Hilaly et al., 2003] and for relief of skin, digestive system and nervous system there is infusion/decoction of fruit powder or oral [Ouhaddou et al., 2014] or fruit powder [Orch et al., 2017]; in Palestine for food, fruits are eaten raw, cooked or ripe [Ali-Shtayeh et al., 2008]; in Sicily for food, fruits are eaten raw, cooked or ripe [Lentini and Venza, 2007]; in Spain for chocolate, coffee substitute and olive preservative the ripe fruits and leaves are used [Tardio et al., 2006]; in Tunisia for food the ripe pods are consumed [Kaderi et al., 2015] and in Turkey fresh podsare used as diuretic and purgative [Fakir et al., 2009].

Cinnamomumcamphora (Linn.) Presl. Camphor Tree, Camphorwood, Camphor laurel • Bengali: karpur • Hindi: Kapur • Kannada: chandara, davala, dhavala, kappara, kapura • Malayalam: chutakkarpuram, ghanarasam, himamsu, himavaluka • Manipuri: Karpura • Marathi: kapoora • Oriya: ramokorpuro • Sanskrit: candraprabha, chandrahba, gandhadravya • Tamil: chukantamaram • Telugu: candramu, candrasanguyamu • Urdu: kafoor (Lauraceae):

Synonyms

Camphoraofficinarum, Laurus camphora

Camphor tree is a large evergreen tree that grows up to 20–30 m tall. The leaves have a glossy, waxy appearance and smell of camphor when crushed. Alternately arranged 1–4 in long oval leaves dangle from long stalks. Each leaf has three distinct yellowish veins. The outer margins of the leaves tend to be somewhat wavy and turn upward. The new foliage starts out a rusty burgundy colour, but the leaves soon turn dark green on the upper sides and paler green underneath. New branches emerging from the shallowly fissured greyish brown trunk are smooth and green. Twigs are usually green, but may be tinged with red when young. The inconspicuous tiny cream coloured flowers are borne in the spring on branching 3 in flower stalks. They are followed by large crops of fruit, comprised of round pea sized berries attached to the branchlets by cuplike little green cones. The berries first turn reddish, then ripen to black. Camphor tree can be readily identified by the distinctive odour of a crushed leaf. Camphor Tree is native to China, Japan, Korea, Taiwan, and adjacent parts of East Asia. It is now cultivated in many parts of the world. The plant is grown commercially in China and Japan as a medicinal tree and also for its essential oil, though most camphor oil on the market nowadays is produced synthetically [Uphof, 1959; Australian Tropical Rainforest Plants Publication]. It has also been widely planted in other areas of the tropics, subtropics and warm temperate zones [World Agroforestry Centre Publication]. At one time it was heavily exploited as a source of camphor, but the availability of cheap, synthetic camphor has meant that there is now only modest international demand for the natural form [World Agroforestry Centre Publication]. Camphor produced from Cinnamon species is often considered superior to synthetic because the molecules are dextorotatory, whereas synthetic camphor (produced from pinene) contains both dextro– and laevorotatory forms and is considered by many Pharmacopoeia's it is to be more toxic [Duong, 1993]. *Cinnamomum camphora* is invasive in parts of Kenya (CABI CPC, 2007) and Tanzania

Ethnobotanical Potential

Young shoots and leaves are cooked and consumed [Tanaka and Nakao, 1976; Kunkel, 1984]. Some caution is suggested because there is a report that the plant is poisonous in large quantities.

The old leaves are dried and used as a spice [Tanaka and Nakao, 1976; Kunkel, 1984]. An essential oil obtained from the plant is used as a food flavouring in baked goods, candy etc [Facciola, 1998]. The essential oil obtained from camphor can vary quite considerably. On distillation, the wood from different groups of trees may yield camphor, linalool, safrole or cineole as the major chemical [World Agroforestry Centre Publication]. The essential oil 'camphor' is obtained from the leaves and twigs [Chittendon, 1951; Grieve. 1984; Uphof, 1959; Sherry; Usher, 1974].

It is extracted commercially by passing a current of steam through the wood chips, 30 kilos of wood yields about 1 kilo of camphor [Vines, 1987]. Camphor is used medicinally, in perfumes, as an insecticide and also to make celluloid and as a wood preservative [Hill, 1952]. It can also be put in shoes to cure perspiring feet [Stuart, 1911] probably by acting as a deodorant rather than preventing perspiration [Fern, 2014].

Fractionation of the camphor-free oil obtained from the tree provides an oil rich in safrole (80% or more), usually called Chinese sassafras oil [World Agroforestry Centre Publication].

The use of the tree as a source of leaf oil has expanded in recent years, and it is now an important source of natural linalool (which is still preferred over the synthetic form for some fragrant applications) [World Agroforestry Centre Publication]. The wood has been burnt as a fumigant during epidemics [Genders, 1994]. Its aroma helps to repel insects [Australian Tropical Rainforest Plants Publication].

The heartwood is brownish-yellow with a green cast, or olive to light olive-brown to blackish-brown; the sapwood is whitish or brownish. The texture is medium to coarse; the grain straight to roes; there is a satiny or silky lustre; the odour is spicy and acts to repel insects. The wood has excellent working qualities and takes a good polish. It is thought by many to be beautifully grained, though some people find it a bit garish. It is used for making furniture, cabinets, the interior finish of buildings etc. [Grieve. 1984; Uphof,1959; Flora of China, 1994; World Agroforestry Centre Publication; Australian Tropical Rainforest Plants Publication]. The essential oil obtained from camphor can vary quite considerably. On distillation, the wood from different groups of trees may yield camphor, linalool, safrole or cineole as the major chemical [World Agroforestry Centre Publication].

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Ethnomedicinal Potential

Camphor has a long history of herbal use in the Orient with a wide range of uses. It has occasionally been used internally in the treatment of hysteria, but in modern day herbalism it is mainly used as the essential oil and internal use is not advised [Chevallier, 1996].

The wood and leaves are analgesic, antispasmodic, odontalgic, rubefacient, stimulant. An infusion is used as an inhalant in the treatment of colds and diseases of the lungs [Uphof, 1959; Sherry.; Yeung, 1985; Stuart, 1911; Bown, 1995].

The plant is more commonly used in the form of the essential oil which can be obtained by distillation of the chipped branches, trunk and wood of the tree, or from the leaves and twigs. Wood 24–40 years old is normally used [Stuart, 1979]. The essential oil is anthelmintic, antirheumatic, antispasmodic, cardiotonic, carminative, diaphoretic, sedative and tonic [Grieve, 1984; Duke and Ayensu, 1985; Bown, 1995; Chopra et al., 1986]. It is used externally in liniments for treating joint and muscle pains, balms for chilblains, chapped lips, cold sores, skin diseases etc and as an inhalant for bronchial congestion [Bown, 1995]. Some caution is advised, excessive use causes vomiting, palpitations, convulsions and death[Bown,1995]. It is possible that the oil can be absorbed through the skin, causing systemic poisoning [Bown, 1995].

The essential oil is used in aromatherapy. Its keyword is 'Piercing' [Westwood, 1993]. It is used in the treatment of digestive complaints and depression [Bown, 1995].

Citrullus colocunthis (L.) SchradIndrayan**,** **c**olocynth, bitter apple, bitter cucumber, desert

gourd, egusi, vine of Sodom, or wild gourd (Cucurbitaceae)

Synonyms

Cucumis colocynthis, Colocynthis vulgaris

Citrullus colocynthis (L.) Schrad with many common names is a desert vinyl plant native to the Mediterranean Basin and Asia, especially Turkey, and Nubia. *Citrullus colocynthis* is a valuable cucurbit plant, widely distributed in the desert areas of the world. *Citrullus colocynthis* fruits are usually recognized for its wide range of medicinal uses as well as pharmaceutical and nutraceutical potential. Bitter Apple is an annual plant resembling the common watermelon. The stems are herbaceous and beset with rough hairs. Leaves, on long stalks, are alternately arranged. They are triangular, many times cut, variously undulating, blunt, hairy, a fine green on upper surface, rough and pale on the underside. Flowers are yellow, appearing singly at axils of leaves. Fruit is round, size of an orange, yellow and smooth, when ripe contains within a hard-leathery rind, a white spongy pulp enclosing numerous ovate compressed white or brownish seeds. This species is globally distributed from Africa, Mediterranean, except Spain, to Indo-Malesia. Within India, it is found wild in the warm, arid and sandy parts throughout, up to an altitude of 1500 m.

Ethnobotanical Potential

The plant was also shown to be rich in nutritional value with high protein contents and important minerals as well as edible quality of seed oil [Hussain et al., 2014].

Fruit are consumed cooked [Facciola, 1998]. Fruits are first boiled in several changes of water to remove a bitter principle, and then made into pickles and preserved [Facciola, 1998].

The fruit is 5–8 cm in diameter [Cucurbitaceae Publication]. Seeds are consumed cooked [Facciola, 1998]. Eaten roasted or ground into a meal and used to make chapattis [Facciola, 1998]. An edible oil is obtained from the seed [Facciola, 1998]. The seeds contain 30–34% of a pale-yellow oil, which contains an alkaloid, a glucoside and a saponin [Cucurbitaceae Publication].

The plant contains a number of potentially toxic compounds and can be harmful if used in quantity. These compounds include elatermidine, glycosides, resin, dihydric alcohol, heltiacontane, citrullin and citrullinic acid. Taken in excess they can cause gastrointestinal pain, diarrhoea, vomiting, hypothermia, cardiac disorders, cerebral congestion and necrosis of liver and renal cells [Mohamed et al., 2006].

Ethnomedicinal Potential

Parts used are roots, fruits and dried pulp.

Roots are purgative. Fruits are bitter, acrid, cooling, carminative, purgative, antipyretic and anthelmintic. Roots are useful in treatment of enteralgia, mammalities, rheumatologic, visceromegaly in children, ophthalmia, ascites, jaundice and uropathy.

Fruits are used for tumours, ascites, leukoderma, ulcers, asthma, bronchitis, urethrorrhagia, jaundice, dyspepsia, constipation, elephantiasis, tubercular glands of the neck and splenomegaly. Fruit-juice contain alpha-elaterin, citrulline, citrullines and citrulluic acid. Dried pulp & unripe fruit: dihydric alcohol, citrullol, p-hydroxybenzyl and methyl ether. The peel-free flesh of ripe fruits contains a yellow, bitter oil, citbittol [DOMAP, 2016].

It is a powerful drastic hydragog cathartic producing, when given in large doses, violent griping with, sometimes, bloody discharges and dangerous inflammation of the bowels. Death has resulted from a dose of 1 1/2 teaspoon fuls of the powder. It is seldom prescribed alone. It is of such irritant nature that severe pain is caused if the powdered drug be applied to the nostrils; it has a nauseous, bitter taste and is usually given in mixture form with the tinctures of podophyllum and belladonna. Colocynth fruits broken small are useful for keeping moth away from furs, woollens, etc.

The plant has been reported to possess a wide range of traditional medicinal uses including in diabetes, leprosy, common cold, cough, asthma, bronchitis, jaundice, joint pain, cancer, toothache, wound, mastitis, and in gastrointestinal disorders such as indigestion, constipation, dysentery, gastroenteritis, colic pain and different microbial infections [Hussain et al., 2014].

Several bioactive chemical constituents from fruits were recorded, such as, glycosides, flavonoids, alkaloids, fatty acids and essential oils. The isolation and identification of curcurbitacins A, B, C, D, E, I, J, K, and L and Colocynthosides A, and B were also reported. The fruit of *Citrullus colocynthis* has been studied extensively for its wide range of biological activities, which include antioxidant, cytotoxic, antidiabetic, antilipidemic, insecticide, antimicrobial and anti-inflammatory [Hussain et al., 2014]. The dried, unripe fruit pulp constitutes

the drug 'colocynth', which is a very strong laxative [Huxley, 1992; Cucurbitaceae Publication].

It is also used as an antirheumatic, anthelmintic, hydrogogue, and as a remedy for skin infections [Uphof,1959; Plant Resources of Southeast Asia]. The fruits and seeds are used in the treatment of diabetes[Mohamed et al., 2006]. The roots have purgative properties and are used in the treatment of jaundice, rheumatism and urinary diseases [Cucurbitaceae Publication]. Some caution should be employed in the use of this remedy because the same is toxic.

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Review Article

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Healthy Aspect of Organic Foods

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Abstract

Organic foods are increasingly gaining eminence. Organically grown foods differ from ordinary foods in many aspects. This review summarizes the health benefits of organic foods based on existing evidence. Organic movement provides viable, life supporting alternative to modernized methods which are damaging human health, polluting the environment and eroding soils. The majority of scientific studies, reviews, and meta-analyses states that there are compositional differences between organic and conventionally produced food. Organic food consumption reduces the risk of several diseases and prolong human life. Organic food production and consumption results in better human health, animal welfare, lower pesticide exposure, and are more environmentally friendly

Keywords: Organic foods; Health benefits; Pesticide; Environment friendly.

Introduction

The science of nutrition is now transiting to organic age. Organic food consumption has become more popular and accepted nowadays and also the market for organic foods has boomed rapidly. Organic food is believed to be better for health than conventional food. Many research studies also shows that organic food is more nutritious and safe. Since more and more people started demanding for organically grown foods, organic farming orchards have increased devoting to the supply of this new ever growing market. The therapeutic value of organic diet pattern is also more recognized. Organic foods not only replenish the body with essential nutrients but also helps to eliminate toxic substances. The important factor behind organic success is positive consumer awareness on health and environment issues.

Organic Foods

The word organic means earth friendly or natural method of producing food. Organic foods are produced without the use of chemicals, herbicides, fungicides, petroleum sewage or sludge based fertilizers or pesticides. Organic food is not bio–engineered, genetically modified, nor it is irradiated. Varieties of foods such as fruits, vegetables, grains, dairy products, meat are organically produced. Organically grown foods looks more fresh and do not contain artificial flavours, preservatives, additives or colours**.** The organic food industry in India is also growing at a rapid rate of 25%–30%. Demand for organic foods is primarily driven by

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consumer concerns for personal health and the environment.[1]

Organic Food Production

Management practices used by organic farmers such as growing catch crops, crop rotations help to protect the soil. Organic farming also results in lower nitrate leaching rates and improves soil fertility. Research indicates that organic farming has greater effect on the improvement of the landscape, wildlife conservation, faunal and floral diversity than non organic farming systems. Restricting the use of pesticides also improves water quality and fewer residues are found in food products. The organic food production system enhance the ecological balance of natural system.[2]

- Natural fertilizers like manure or compost are used to nourish soil and plants.
- Natural predators such as insects, arachnids, and other animals, biological control agents (good bacteria and fungi), mating disruption or traps, and specialized farming practices reduce the incidence of pests and diseases
- Giving animal organic feed and free ranging access.
- Genetically modified organisms that have been changed by injecting it with genetic material from another species were not used in organic products. Organic cows and poultry will not be injected with hormones, stimulants and antibiotics.

Identifying Organically Grown Food

Organic is a labeling term that indicates that the food or other agricultural product has been produced through approved methods. The organic standards describe the specific requirements that must be verified by a USDA-accredited certifying agent before products can be labeled USDA organic. According to the United States Department of Agriculture (USDA), an organic certification program requires all organic food to meet strict government standards.

The USDA categorizes food products into the following sections

100% organic	Must contain 100% organically produced ingredients
Organic	Must contain at least 95% organic ingredients
Made of organic ingredients	Must contain at least 70% organic ingredients
Have some organic ingredients	May contain less than 70% organic ingredients

The USDA certificate assures product labeled meet high standards for safety, quality and purity.

Benefits of Organic Food

Research Studies Supporting Nutritional Benefits of Organic Food:

The nutritional content of crops may be influenced by the method of production. Organic food is higher in total antioxidant capacity, total polyphenols, flavonoids, quercetin and other nutrients all of which are nutritionally significant. A 2014 meta-analysis of 343 studies on phytochemical composition found that organically grown crops had lower cadmium and pesticide residues, and 17% higher concentrations of polyphenols than conventionally grown crops.[3] After reviewing several studies comparing the nutritional value of organically grown and conventionally grown fruits, vegetables, and grains, researcher Worthington concluded there were significantly more of several nutrients in organic crops. They contained 27% more vitamin C, 21.1% more iron, 29.3% more magnesium, and 13.6% more phosphorus. A 2008 report jointly produced by The Organic Center and professors from the University of Florida Department of Horticulture and Washington State University provides evidence that organic foods contain, on average, 25% higher concentration of 11 nutrients than their conventional counterparts. According to a 2014 study published in the *British Journal of Nutrition*, the higher antioxidant levels in organic products might actually enhance its organoleptic qualities, its aroma, taste, and even the sensation in the mouth. Thus organic foods taste better than conventional food.

Research on organic milk has reported higher levels of antioxidants and beneficial fatty acids such as conjugated linoleic acid (CLA) and omega-three fatty acids. A 2016 study in the *British Journal of Nutrition also found that* organic milk have less saturated fat than non-organic. Also, organically produced meat is leaner with healthier fat. A 2016 systematic review and meta-analysis found that organic meat had comparable or slightly lower levels of saturated fat and monounsaturated fat as conventional meat, but higher levels of both overall and *n*–3 polyunsaturated fatty acids.

Organophosphate is a class of pesticides that

includes the common and toxic malathion and chlorpyrifos. A study published in 2015 compared the urine concentrations of organophosphorus pesticides and their metabolites in children eating conventional vs. organic diets. The results found that for certain types of pesticides, such as organophosphates, diet are the primary route of exposure and switching to an organic diet decreases exposure substantially.

Advantages of organic food: Retains at least 50% more natural nutrients like vitamins and minerals than artificially grown food.

1. Not hazardous for health as they contain no chemicals. Lesser chances of getting allergies.
2. Tastes more natural and delicious as no sweeteners, coloring, flavors and preservatives are added.
3. Organic food protects from cancer and other diseases.
4. Environment: Organic agriculture helps to keep our oceans, lakes, rivers and water supplies clean. In general the environment clean. Organic foods promote healthier and more sustainable use of natural resources. Modern farming methods, including excessive use of chemicals, have led to a decline in soil fertility and an increase in salinity and blue-green algae in waterways over many years. Organic farmers try to minimize damage to the environment by using physical weed control, and animal and green manure. Organic farming practices are designed to benefit the environment by reducing pollution and conserving water and soil quality.[4]

Foods may be organic or not but be sure to use these tips:

Select a variety of foods from a variety of sources: Better combination of nutrients and reduce exposure to a single pesticide.

Buy seasonal fruits and vegetables: To get the fresh product, buy food from your local farmers market.

Read food labels carefully: Just because a product says it's organic or contains organic ingredients doesn't necessarily mean it's a healthier alternative. Some organic products may still be high in sugar, salt, fat or calories.

Wash and scrub fresh fruits and vegetables thoroughly under running water: Washing helps remove dirt, bacteria and traces of chemicals from the surface of fruits and vegetables, but not all pesticide residues can be removed by washing.

Discarding outer leaves of leafy vegetables can reduce contaminants: Peeling fruits and vegetables can remove contaminants but may also reduce nutrient

Conclusion

All population including vulnerable groups such as pregnant women, young children, the elderly and people suffering from various diseases may promote their health from choosing organically produced foods. Organic movement will uphold healthy life.

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Standard journal article

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