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# Editorial Board

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# MINICHROMOSOME TECHNOLOGY

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Genetic engineering is an important method for increasing crop quality and production while lowering labour and resource use in agriculture (Ceccarelli *et al.*, 1992). Traditionally, genetic modification has been accomplished by either Agrobacterium-mediated transformation (Opabode *et al.*, 2006) or direct transformation using a gene gun and particle bombardment (Altpeter *et al.*, 2005). Since these approaches allow for the insertion of single or few genes at random genomic locations and enable the simultaneous expression of several genes, they have many limitations; however, complex or combined traits cannot be transferred in a synchronised manner (Yu *et al.*, 2007b). For desired outcomes, these approaches are labour-intensive and time-consuming procedures that often necessitate highly qualified personal and substantial feedback. Furthermore, a large number of phenotypically abnormal plants are restored, and the host genome's utility is often disrupted.

Minichromosome technology offers a single solution for expressing and maintaining many transgenes in a single genome. Furthermore, plant artificial chromosomes or engineered minichromosomes may be a useful research method for deciphering chromosome structure and function. Since it is currently difficult to effectively insert massive repetitive DNA molecules into plant cells, minichromosomes, either naturally occurring or caused by irradiation, are an effective alternative for deciding minimum usable sizes of centromeres and constructing artificial chromosomes (Houben *et al.*, 2007 and Schubert *et al.*, 2007). Because of their ability to survive episomally, bear massive DNA inserts, and enable gene expression independent of the host genome, mammalian artificial minichromosomes have many potential biotechnological and therapeutic applications (Irvine *et al.*, 2005).

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## What is Minichromosome?

A minichromosome is a very small variant of a chromosome, which consists of thread-like linear or circular DNA and related proteins that contain genes and functions in the genetic material transmission process. Minichromosomes are plasmids that reproduce independently from *ori C*. (von Meyen burg *et al.*, 1979). They resemble their chromosomal counterparts in that they depend on functional *DnaA* and *DnaC* products, de novo protein synthesis, and RNA polymerase mediated transcription to initiate bi-directional replication (Messer *et al.*, 1996 and Weigel *et al.*, 1996). Transposable or repeated elements are also considered to be abundant in minichromosomes (Shiflett *et al.*, 2002). Radiation-induced breakages were the most common cause of minichromosome formation.

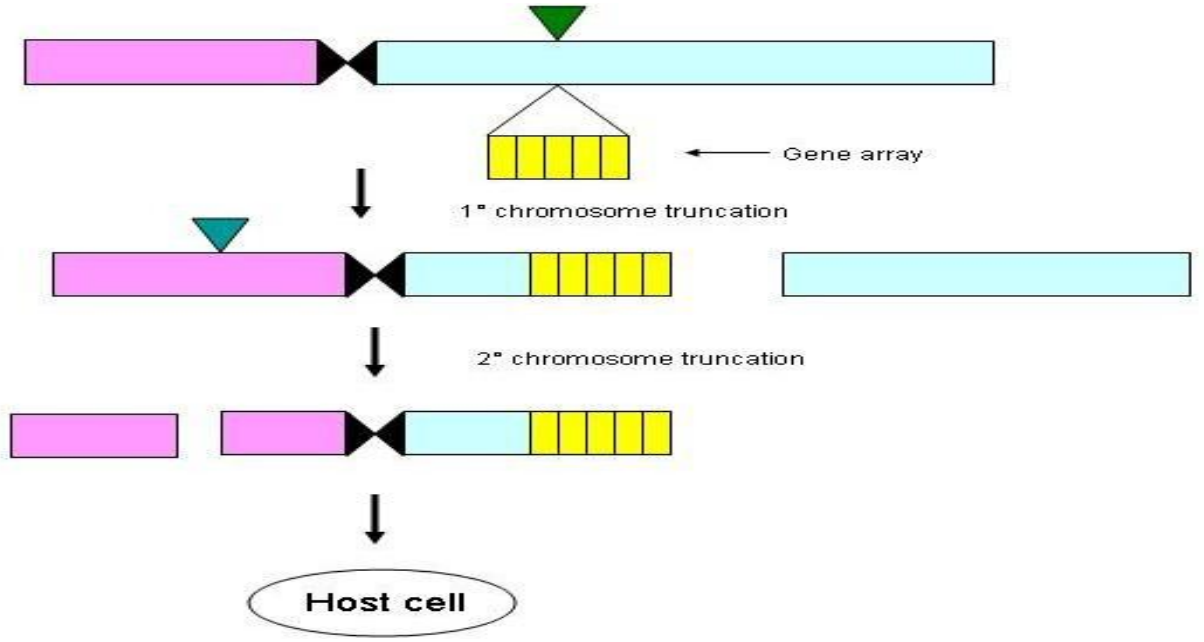


**Fig 1:** *Mini chromosomes can be produced by telomere mediated chromosome truncation* (Aakash *et al.*, 2009)

## Minichromsome in Plants

Previously, the role and application of minichromosomes were not well understood or recorded in the primary literature. Minichromosomes were later discovered to be very useful in understanding the fundamentals of chromosomal function and in plant genetic engineering (Birchler *et al.*, 2008; Houben *et al.*, 2008). Minichromosome technology has recently emerged as a powerful tool for improving crop plants.

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### *Minichromosomes in Arabidopsis*

A minichromosome was discovered in the telocentric line of *A. thaliana* using the Fluorescence In Situ Hybridization (FISH) method, and it was discovered to be from the short arm of chromosome number 4 (Murata *et al.,* 2006). This "mini4S" chromosome was estimated to be 7.5 Mb in size. Two additional minichromosomes (α, β and δ)have recently been found (Fig 2; Murata *et al*., 2008). These two minichromosomes were discovered in an in-planta vacuum infiltration transgenic *Arabidopsis* plant.

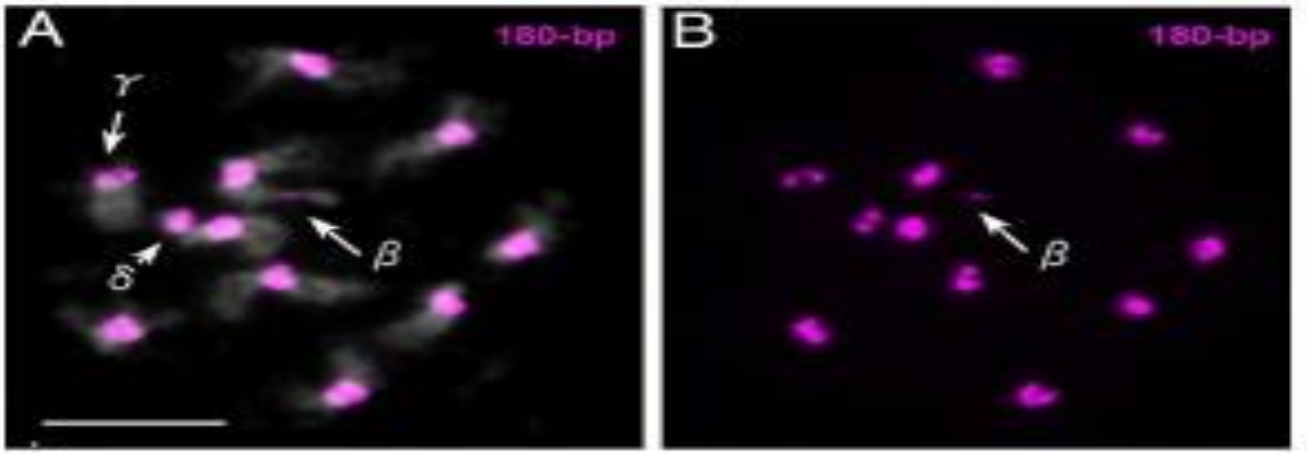


**Fig 2:** *Cytological analysis of a G40 Arabidopsis cell containing minichromosomes α, β, and δ*(Murata *et al*., 2008).

### *Minichromosome in Maize*

Maize minichromosomes have recently been generated by truncating the A and B chromosomes using telomere-mediated chromosome truncation (Fig. 3; Yu *et al*., 2007a). Repeated backcrossing was used to move these minichromosomes to a diploid context to keep them stable. Although they produced A and B minichromosomes using this method, they were more interested in B chromosome-based minichromosomes because B chromosomes have a number of interesting properties (Kato *et al.*, 2005), including: (1). Unlike A chromosomes, truncation of B chromosomes would not induce developmental, or transmission complications, (2) Shape and the location of a B chromosome unique repeat in and around the centromeric region differentiate B chromosome derivatives, (3) Since there would be no residual endogenous genes to interfere with plant growth and transgene transmission, the size of mini-B chromosomes is unimportant.

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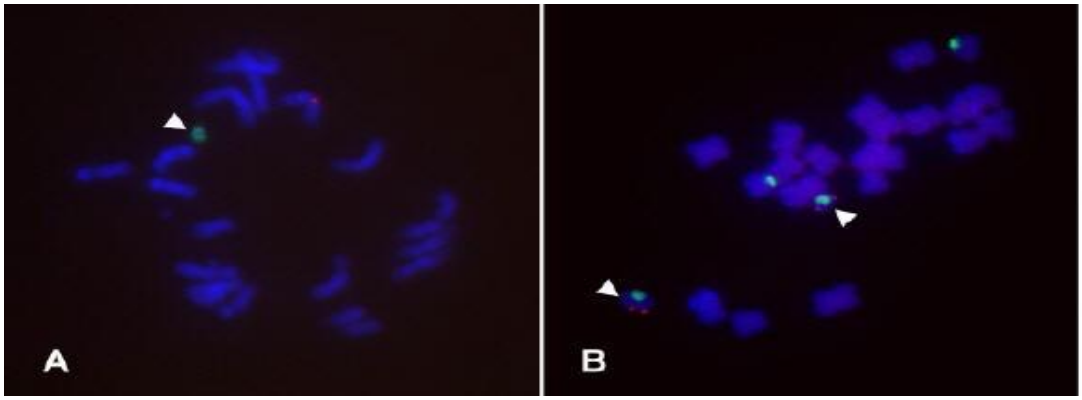


**Fig 3:** *Mini chromosomes produced from maize B chromosome truncation, arrows denote mini chromosomes* (Yu *et al*., 2007a).

## Conclusion

Any programme that involves the inheritance of several foreign genes as a unit may benefit from future innovations. Plants will also have whole biochemical pathways added to them in order to impart new properties or synthesise novel metabolites in large amounts. The quantity of mini-B chromosomes can be expanded to optimise the contribution from foreign genes on the minichromosome. Minichromosomes can be formed in most plant species due to the conserved telomere structure, allowing for a wide range of new applications in most agricultural crops.

## Reference

Aakash Goyal, Pankaj Kumar Bhowmik and Saikat Kumar Basu, Minichromosomes: The second-generation genetic engineering tool. *Plant Omics Journal* 2(1):1-8 (2009).

Altpeter F, Baisakh N, Beachy R, Bock R, Capell T, Christou P, Daniell H, Datta K, Datta S, Dix PJ, Fauquet C, Huang N, Kohli A, Mooibroek H, Nicholson L, Nguyen TT, Nugent G, Raemakers K, Romano A, Somers DA, Stoger E, Taylor N, Visser R (2005) Particle bombardment and the genetic enhancement of crops: myths and realities. *Mol Breed* 15:305–327

Birchler JA, Yu W, Han F (2008) Plant engineered minichromosomes and artificial chromosome platforms. *Cytogenet Genome Res* 120: 228-232

Ceccarellia S, Valkouna J, Erskinea W, Weiganda S, Millera R, Van Leur JAG (1992) Plant genetic resources and plant improvement as tools to develop sustainable agriculture.

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*Exp Agric* 28:89- 98

Houben A, Schubert I (2007) Engineered plant minichromosomes: A resurrection of B chromosomes? *The Plant Cell* 19:2323–2327

Irvine DV, Shaw ML, Andy Choo KH, Saffery R (2005) Engineering chromosomes for delivery of therapeutic genes. *Trends Biotechnol* 23:575-583

Kato A, Zheng YZ, Auger DL, Phelps-Durr T, Bauer MJ, Lamb JC, Birchler JA (2005) Minichromosomes derived from the B chromosome of maize. *Cytogenet Genome Res* 109: 156–165

Messer W and Weigel C (1996) Initiation of chromosome replication. In: Neidhart FC, Curtiss R, Ingraham JL, Lin ECC, Low KB, Magasanik B, Reznikoff WS, Riley M, Schaechter M, Umbarger HE (eds) *Escherichia col*i and *Salmonella typhimurium*: Cellular and Molecular Biology. *American Society for Microbiology*, Washington DC, pp 1579–1601

Murata M, Shibata F, Yokota E, (2006) The origin, meiotic behavior, and transmission of a novel minichromosome in *Arabidopsis thaliana*. *Chromosoma* 115:311-319

Murata M, Yokota E, Shibata F, Kashihara K, (2008) Functional analysis of the Arabidopsis centromere by T-DNA insertion-induced centromere breakage. *Proc Natl Acad Sci* USA 105:7511-7516

Opabode JT (2006) Agrobacterium-mediated transformation of plants: emerging factors that influence efficiency. *Biotech Mol Biol Rev* 1:12-20

Shiflett AM, Enkerli J, Covert SF (2002) Nht2, a copia LTR retrotransposon from a conditionally dispensable chromosome in *Nectria haematococca*. *Curr Genet* 41:99–106

von Meyenburg K, Hansen FG, Riise E, Bergmans HEN, Meijer M and Messer W (1979) Origin of replication, oriC, of the Escherichia coli K-12 chromosome: Genetic mapping and minichromosome replication. *Cold Spring Harbor Symp Quant Biol* 43:121–128

Yu W, Han F, Birchler JA (2007b) Engineered minichromosomes in plants. *Curr Opin Biotechnol* 18:425-431

Yu W, Han F, Gao Z, Vega JM, Birchler JA (2007a) Construction and behavior of engineered minichromosomes in maize. *Proc Natl Acad Sci* USA 104:8924-8929.

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# STUBBLE BURNING: CAUSE, IMPACT AND MITIGATION

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Crop residue burning is not a recent trend adopted by Indian farmers during crop harvesting, especially in the months of Oct- Nov before sowing of Rabi season crop. But last few years it has been an alarming issue due to increasing pollution, mainly air and soil, which causes detrimental effects in not only human beings but also on the environment. According to the survey, India produces 371 million tones of crop residue annually, out of which wheat and rice contribute 27-36% and 51-57%, respectively. Uttar Pradesh is the largest in this regard, followed by Punjab, Maharashtra, and West Bengal. A large number of farmers have engaged in stubble burning techniques as they have a very short time span for preparation of land to next crop sowing during the winter season. Although Govt. has introduced new machineries such as combine harvester that helps farmers to cut the mature crop leaving behind a small portion of crop biomass(straw) above ground (up to 9.0 t $ha^{-1}$) that makes farmers difficult to sow next crop in this point, needs time for land preparation. As farmers are not furnished and prepared to manage the large mass of residues left in the field, to avoid delay sowing of next crop, farmers used to burn the stubble in their own land which they think of economic and cost effective strategy to manage these crop residues.

## Major Causes

1. Scarcity of labour.
2. Short time duration for preparation and cleaning of field.
3. Low supply of adequate farm machinery for harvesting purposes.
4. Lack of knowledge of crop residue management.
5. Low cost management of pests and weeds in the field.
6. Getting short term availability of nutrients.

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## Impact of Crop Residue Burning

### 1. Depletion of air quality standard

Uncontrolled combustion leads to the production of Co, $Co_2$, $No_x$, $So_2$, etc., in the atmosphere, which in turn causes air pollution. Studies revealed that the burning of one ton of paddy straw liberates 3 kg particulate matter, 60 kg carbon mono-oxide, 1460 kg carbon dioxide, 199 kg ash, and 2 kg of sulfur dioxide. The level of greenhouse gas also increases the annual contribution of 0.10 Tg of $SO_2$, 0.96 Tg of $NO_x$, 379 Tg of $CO_2$, 23 Tg of Co, and 0.68 Tg of $CH_4$ was estimated from the burning of crop residues (Badrinath *et al.* 2006) estimated the greenhouse gas (GHG) emissions from cereals burning mainly rice and wheat straw in Punjab during May and October 2005 and suggested that emissions from wheat crop residues in Punjab are relatively low compared to those from paddy fields.

The estimated value of PM 2.5 mass concentration varies from 60 to 390 mg m−3 during paddy residue burning (Gadde *et al*., 2009).

### 2. Harmful effects a human and animal

Increasing stubble burning practice contributes to emissions of harmful air pollutants, which can cause severe impacts on human health viz. chronic heart disease and lung cancer, as asthma, coughing; the effect is more prominent particularly affecting children, geriatrics and pregnant women. Other than these greater threats for leukemia, blood bone marrow disease, vertigo, drowsiness, headache, nausea, aplastic anemia, and pancytopenia and myelodysplastic syndrome cytopenia to benzene exposure (Chandra and Sinha 2016). Beneficial microorganism bacteria, earthworm etc. dies due to fire. Snakes, frogs, earthworms, lizards die in the holes. All green vegetation around the field burns, causing a decrease in the number of birds residing in Sparrows, eagles, vultures are becoming extinct because of this. This could lead to the loss of biodiversity.

### 3. Deteriorating the soil health quality

Burning of straw raised the soil temperature up to 33.8- 42.2 °C at 10 m depth (Gupta *et al*., 2004). Almost 23-73% of nitrogen is lost, and the fungal and bacterial populations are decreased immediately in the soil. Significant reduction in soil structural stability as organic carbon is decreasing due to stubble burning. The burning of straw raised

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the temperature of the soil, which creates an imbalance in the carbon-nitrogen equilibrium in the soil system.

**4. Loss of nutrients**

Nutrient budgeting and balance have been hampered due to residue burning. Carbon, nitrogen, and sulfur present in straw are entirely burnt and lost to the atmosphere. Complete loss of C, 80% of N, 25% of P, 50% of S, and 20% of K (Kumar, 2016) existing in straw occurs. It was estimated that one ton of paddy burning of paddy straw causes a loss of about 79.38 kg $ha^{-1}$ N, 183.71 kg $ha^{-1}$ P, and 108.86 kg $ha^{-1}$ K (Jat *et al*., 2013).

## Mitigation Techniques

**1. Adaptation of Resource conservation technologies (RCTs)**

RCTs provide a better promise in managing paddy residues for improving soil health, productivity, reducing pollution, and achieving sustainable agriculture. For direct seeding of the successive crop in standing crop stubble, advanced technology of zero-till seed-cum-fertilizer drill/seed planters (happy seeder, spatial zero seed cum fertiliser drill) has been developed.

No-tillage (NT) coupled with stubble retention (SR) and nitrogen (N) fertilizer application (90 N, 90 kg N $ha^{-1}$ application) can help improve soil aggregation(somadun-darum,2016). Sun et al. 2007 reported that soil organic matter increased 15.8% -18.1%, 6.6% -10.6%, and 1.3% 1.9% stubble retention compared with straw removal in the 0–10,10–20, 20–40 cm depths in Wushan soils of China after 15 years. It is reported that the yield of wheat was 21% (0.344 t ha−1), which more under no till with stubble cover than conventional tillage after eight years of cultivation (Huang,2012). It is evident that better soil aggregation was recorded under no tillage that could have a positive influence on soil C sequestration.

**2. Mulching effect**

Residue retention in the soil surface can control soil temperature by lowering it in the summer season and increasing minimum soil temperature during the winter season. Thus it minimizes the evaporation loss of moisture in summer months and maintains optimum soil temperature in both the season for crop growth and enhances the microbial activity. It reduces

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soil erosion through surface runoff and also lowering soil compaction that directly affects root growth and poor crop establishment. Organic mulches actively accelerate soil desalinization and help to degrade the residual effects of pesticides and other contaminants, which would decline the soil fertility status. Mulches can also reduce seed germination of many weed species and reduce light exposure to weeds, which stresses existing weeds to sprout.

### 3. Improving soil health biodiversity

In-situ incorporation of crop residue has several positive impacts on soil health attributes such as pH, organic carbon, infiltration rate, and water holding capacity. It increases hydraulic conductivity, cation exchange capacity (CEC), and reduces bulk density of soil by improving soil structure and aggregate stability, minimizes surface crust formation, water evaporation from the top few inches of soil, and prevents leaching loss of nutrients. It also increases the microbial biomass, their population and enhances activities of enzymes such as dehydrogenase and alkaline phosphatases, which helps in nutrient mineralization and mobilization. It is reported that 6 g of Nitrogen and 0.8 g of phosphorous per kg of paddy straw leads to saving 15–20% of total fertilizer's use (Lohan *et al*., 2018).

### 4. Increasing nutrient availability

Stubble-induced changes in soil total N are often directly related to changes in soil organic C content as soil organic matter could influence nutrient retention and supply. Both stubble retention and not tillage can increase soil total N concentration significantly at the soil surface 0–5 cm. No significant increase in total P concentration in the lower layer (10-30cm) in soil due to immobilization of fertilizer P and surface stubble cover. But in the topsoil layer increasing trend of total p concentration was observed in Field pea and wheat rotation. Available K concentration was significantly greater in the top 5 cm depth of stubble retention treatments in wheat and field pea rotation sequence. Therefore, the combined use of rice or wheat straw and inorganic fertilizer can, however, increase the yield of rice and wheat in rice-wheat systems in Indian conditions.

### 5. Off farm use of residue after harvest

Collected residue can also be used for animal feeding, domestic fuel purposes etc. Wheat straw is mainly used for fodder purposes instead of rice; this is mainly because high

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silica content in the rice residue. In this aspect, straw baler machines can effectively use and commercially available that provide a solution for straw management in an environmentally friendly manner. Paddy straw can also be used for the cultivation of mushrooms such as Agaricus *bisporus*, *Volvariella volvacea*, and Pleurotus *spp*. One kg of paddy straw yields 300, 120–150, and 600 g of (Ojha and Tiwari, 2019) these mushrooms, respectively. Surprisingly bio thermal power plant uses paddy straw for generation of electricity. A 10 MW biomass based power plant is set up at village Jalkheri, Fatehgarh Sahib, where paddy straw is used as fuel. Paddy straw can also be used in paper and pulp production company Punjab state govt have been advised to use paddy straw as bedding material for crossbred cows during winter months. This paddy straw bedding provides comfort, good udder health, and leg health to the animals resulting in the increased quality and quantity of milk produced.

## Conclusion

Stubble burning in India enhances the concentration of greenhouse and other toxic gases like benzene and toluene, which would increase the risk of farmers and villagers nearest to the field. The use of agricultural waste is an essential hinge not only for sustainable agriculture but also in the equilibrium of the entire human society. In this sense, the practice of utilizing crop residues as amendments to improve the soil fertility status and also maintain the ecological balance. Accusing only the farmers may not the solution to these problems; there is a need to find sustainable technological strategies. In this context, Promotion of technologies for optimum utilization and in-situ diversified uses of agricultural waste, Capacity building of various stakeholders including farmers and extension functionaries through different scheme and development programs, and organizing of field level demonstrations, and formulation and implementation of necessary policy measures for control of agricultural waste through suitable laws/ legislation/ executive orders.

## Reference

Chandra, B.P. and Sinha, V., 2016. Contribution of post-harvest agricultural paddy residue fires in the NW Indo-Gangetic Plain to ambient carcinogenic benzenoids, toxic isocyanic acid and carbon monoxide. *Environment international*, *88*, pp.187-197.

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www.agriallis.com

Gadde, B., Bonnet, S., Menke, C. and Garivait, S., 2009. Air pollutant emissions from rice straw open field burning in India, Thailand and the Philippines. *Environmental Pollution*, *157*(5), pp.1554-1558.

Gupta, P.K., Sahai, S., Singh, N., Dixit, C.K., Singh, D.P., Sharma, C., Tiwari, M.K., Gupta, R.K. and Garg, S.C., 2004. Residue burning in rice–wheat cropping system: Causes and implications. *Current science*, pp. 1713-1717.

Jat, M.L., Kamboj, B.R., Sidhu, H.S., Singh, M., Bana, A., Bishnoi, D.K., Gathala, M.K., Saharawat, Y.S., Kumar, V., Kumar, A. and Jat, H.S., 2013. Operational manual for turbo happy seeder: technology for managing crop residues with environmental stewardship.

Kumar, R., 2016. Crop residue generation and management in Punjab state. *Indian Journal of Economics and Development*, *12*(1a), pp. 477-483.

Lohan, S.K., Jat, H.S., Yadav, A.K., Sidhu, H.S., Jat, M.L., Choudhary, M., Peter, J.K. and Sharma, P.C., 2018. Burning issues of paddy residue management in north-west states of India. *Renewable and Sustainable Energy Reviews*, *81*, pp.693-706.

Ojha, J., and Tiwari, D., 2019. Stubble burning: An issue that touches field in rural area and lungs in urban. International journal of chemical studies. SP-6, pp 69-72

Somasundaram, J., Reeves, S., Wang, W., Heenan, M. and Dalal, R., 2017. Impact of 47 years of no tillage and stubble retention on soil aggregation and carbon distribution in a vertisol. *Land Degradation & Development*, *28*(5), pp.1589-1602.

Sun, X., Liu, Q., Wang, D.J. and Zhang, B., 2007. Effect of long-term application of straw on soil fertility. *Chinese Journal of Eco-Agriculture*, *16*(3), p.5872592.

Huang, G.B., Luo, Z.Z., Li, L.L., Zhang, R.Z., Li, G.D., Cai, L.Q. and Xie, J.H., 2012. Effects of stubble management on soil fertility and crop yield of rainfed area in Western Loess Plateau, China. *Applied and Environmental Soil Science*, *2012*.

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# MEDICINAL VALUE OF ORCHID-A NOVEL PERSPECTIVE

Article Id: AL202171

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Orchids are members of the family Orchidaceae, one of the largest families of flowering plants. The estimated number of orchid species varies from 12,000 to 35,000, contributing up to 10% of all flowering plant species in the world (Dressler, 1981). Orchids form 9% of our flora, and about 1331 species are reported from India (Mishra, 2007). Orchids are extremely popular for their mesmerizing marvelous flowers in the whole world, but it is in the lesser know that many species are used in traditional systems of medicine and form remedial measures for a number of ailments. Out of many medicinal and aromatic plants, orchids have been used as the traditional system of medicines. This may account for the use of orchids as aphrodisiacs in ancient civilization. When we study the history of the ancient alternative system of medicine, Ayurveda and Traditional Chinese Medicine (TCM) are one of the forefronts. Asthavargha is an important ingredient of various classical Ayurveda formulations like chyawanprasha. Out of eight constituents of Asthavargha, four have been reported to be orchids as '*Jivaka*' (*Malaxismuscifera*), '*Rishbhaka*' (*M. acuminate*), '*Riddhi*' (*Habenaria intermedia*), and '*Vriddhi*' (*H. edgeworthii*). A wide range of chemical compounds is, presented, including alkaloids, bibenzyle derivatives, flavonoids, phenanthrenes, and terpenoids which have been isolated from various orchids from different parts of the world. Extracts and metabolites of these plants, particularly those from flowers, roots, and leaves, possess useful in pharmacological activities *viz.* diuretic, anti-rheumatic, anti-inflammatory, anti-carcinogenic, hypoglycaemic activities, anti-microbial and, anti-convulsive activity.

Orchidaceae is a diverse and widespread family of flowering plants with beautiful, colorful, and fragrant flowers, commonly known as the orchid family. Along with the Asteraceae, this is one of the two largest families of flowering plants, with between 21,950 and 26,049 currently accepted species, found in 880 genera (Stewart and Griffiths, 199). The

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family also encompasses about 6–11% of all seed plants (Pillon and Chase, 2007). The largest genera are: *Bulbophyllum*(2,000 species), *Epidendrum* (1,500 species), *Dendrobium* (1,400 species) and *Pleurothallis* (1,000 species). Selecting which of the two families is larger is still under debate, as concrete numbers on such enormous families are constantly in flux. The Orchidaceae is currently placed in the order Asparagales by the APG III system of 2009 (Pillon and Chase, 2007). The name Orchid comes from the Ancient Greek word *órkhis*, literally meaning "testicle", because cultivated orchids are tropical or subtropical, but quite a few which grow in colder climates can be found on the market. Temperate species available at nurseries include *Ophrysapifera*(bee orchid), *Gymnadeniaconopsea*(fragrant orchid), *Anacamptis pyramidalis* (pyramidal orchid), and *Dactylorhizafuchsia* (common spotted orchid). Orchids of all types have also often been sought by collectors of both species and hybrids such, many hundreds of societies and clubs worldwide have been established. These can be small, local clubs such as the Sutherland Shire Orchid Society or larger, national organizations such as the American Orchid Society. Both serve to encourage the cultivation and collection of orchids, but some go further by concentrating on conservation or research. *Vanilla plantfolia*is a commercially important orchid as it is the source of vanillin used as a food stuff flavoring.

## Medicinal Importance

Orchids have been used in traditional medicine in an effort to treat many diseases and ailments. They have been used as a source of herbal remedies in China since2800 BC. Orchids have many medicinal properties like alkaloids, bibenze derivatives, flavanoids, terpanoids, Phenanthrenes. They can be used to cure many diseases viz., Diuretic, anti-inflammatory, anti-carcinogenic, anti-microbial, anti-convulsive, relaxation, neuroprotective, anti-rheumatic*etc*. *Gastrodiaelata*is one of the three orchids listed in the earliest known Chinese Materia Medica. Theophrastus mentions orchids in his *Enquiry* into Plants (372–286 BC). In the following paragraphs, the medicinally important plants are listed along with their uses and important chemical constituents of medicinal value. Has described the uses of orchids for drugs and chemicals. Hegde and Ingalhalli (1988) have described the medicinal usage of some orchids. Singh and Duggal (2009) have given an overview of medicinal orchids along with recent pharmacological investigations. In the following paragraphs, the medicinal uses of various orchids have been described.

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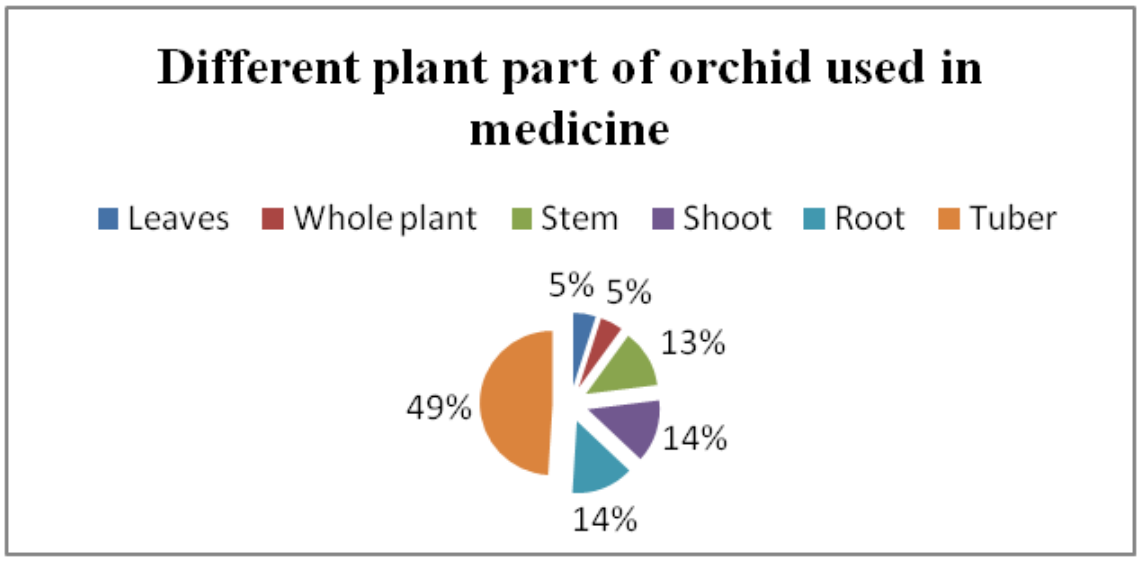


### *Vanda roxburghii*

It contain β-sitosterol, γ-sitosterol, heptacosane, octacosanol, acetyl tetracosyl ferulate 17-β-hydroxy-14,20-epoxy-1-oxo-[22R]-3β-[O-β-Dglucopyranosyl]-5,2withadienolideandmelianin. Sterols are anti-inflammatory agents. β-sitosterol has been shown to possess anti-inflammatory and anti-pyretic properties. Epilepsy is one of the most common disorders of the central nervous system (CNS). Currently, available treatment for epilepsy possesses major side effects like minimal impairment of central nervous to death due to aplastic anemia or hepatic failure as a result of which sufferings of patient increases. Since plants have provided many drugs in the past and they remain a rich source of novel compounds, hence an attempt is made to evaluate anticonvulsant effects of alcoholic extract of *Vanda roxburghii.*

### *Vanda tessellate*

The traditional use indicates that various parts of this plant are likely to have several pharmacological properties. Lawlerreported that several Ayurvedic type preparations containing this plant (root or whole plant) were used as an aphrodisiac and given for impotence and barrenness. Furthermore, one of the authors (Suresh Kumar P.K.) has come across the traditional use of this plant root for impotence in males in Amboori village in Thiruvananthapuram district. In view of these, in the present study, we have evaluated the effects of various parts of this plant on male sexual behavior and reproductive performance in

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mice. The active alcohol extract of the flower as also subjected to general short-term toxicity studies in mice.

### *Rhynchostylis retusa*

Common name: Foxtail Orchid, Sanskrit name: Banda and Rasna) is a medium-sized monocotyledon plant and grows in Bangladesh. The fresh leaves or their extracts traditionally is used to treat rheumatic disease, ear pain, blood dysentery, skin diseases, and external inflammations (Hossain, 2011; Siljaet *al*., 2008; Jonathan and Raju, 2005). Various preparations of this plant are also traditionally used to cure asthma, tuberculosis, epilepsy, vertigo, palpitation, kidney stone, and menstrual disorders (Hossain, 2011). It is reported that the plant showed significant antibacterial activity against *Bacillus subtilis* and *Escherichia coli.* Although this plant is traditionally applied for the treatment of several diseases, but to our knowledge, there are no systematic scientific studies on it. This paper deals with the analgesic and anti-inflammatory activities of *Rhynchostylisretusa*(L.) Blume in mice model.

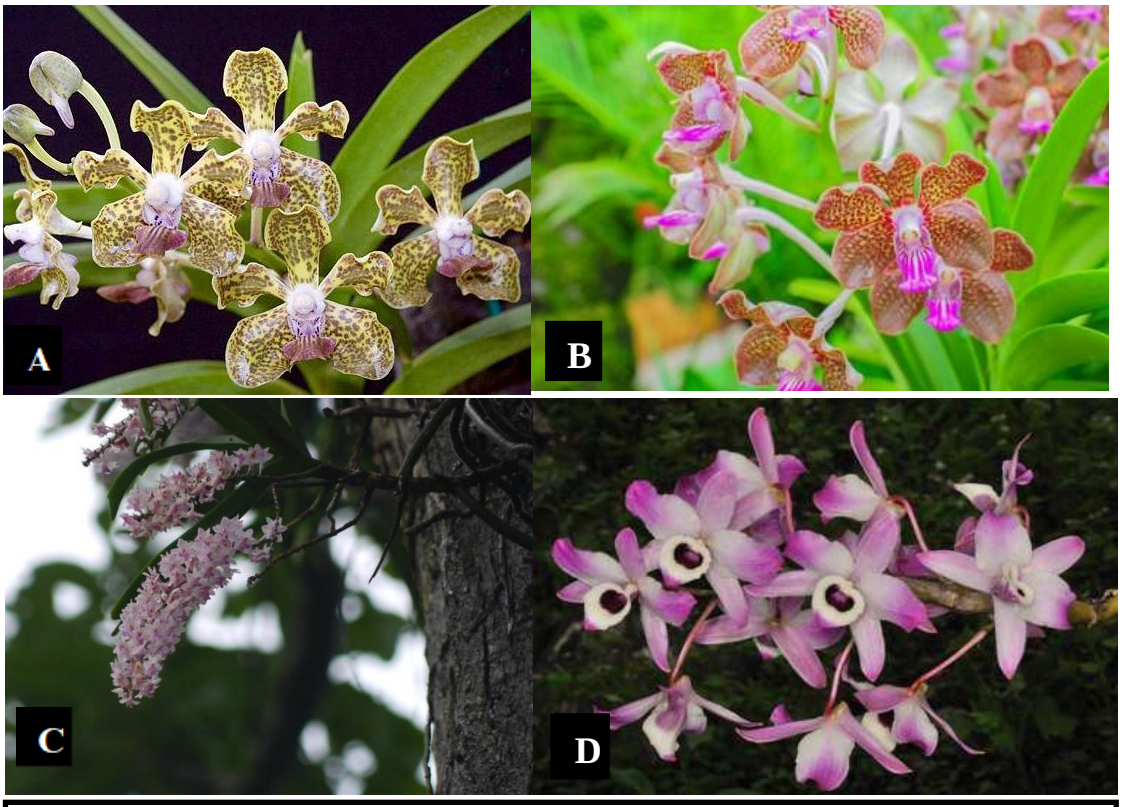


**Figure 1:** (a) *Vanda roxburghii* (b) *Vanda tessellate* (c) *Rhynchostylisretusa*(d) *Dendrobium nobile*

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### *Dendrobium spp.*

Medicinal plants from *Dendrobium* genus are highly valued, and therefore methodologies are being developed to validate *Dendrobium* derived drugs for their therapeutic use. In a study by Ho and Chen, it has been reported that *Dendrobium* species possess anticancer activity. Their group has found that moscatilin, extracted from the stems of *Dendrobium loddigesii*, shows potent cytotoxicity against cancer cell lines derived from different tissue origins. Erianin, a natural product extracted from *Dendrobium chrysotoxum*, inhibits the growth of HL-60 cells. The ethanolic extract of stems of *Dendrobium nobile*was foundto exhibit significant antioxidant activity. The antitumor and antibacterial activities of *Dendrobiumnobile*extract have also been reported. After acquiring knowledge about the anticancer activity of different *Dendrobium species*, we identified and selected the plant, *Dendrobium formosum*, as there are no reports of its antitumor activity till now. To the best of our knowledge, this is the first study to demonstrate the antitumor activity of *Dendrobium formosum*.

## Conclusion

From the above foregoing discussion, it can be concluded that the medicinal orchids belong mainly to the genera *Dendrobiun, Coelogyne, Cymbidium, Cypipedium, Eria, Calanthe, Bulbophyllum, Habenaria, Pholidota, Galeola, and Gastrodia used as medicinal property.* A number of alkaloids have been extracted from these orchids, such as chysine, drobine, dendronine, grandifolin and crepidine. A wide range of chemical compounds are presented including alkaloids, bibenzyle derivatives, flavonoides, phenanthrenes and terpenoides which have been isolated from various orchids from different parts of the world. Extracts and metabolites of these plants, particularly those from flowers, root and leaves, possesses useful pharmacological activities. Particular attention has been given to diuretic, anti-rheumatic, anti- inflammatory, anti-carcinogenic, hypoglycemic activities, anti-microbial, anti-convulsive, relaxation and neuroprotective.

## Reference

Ahmed, F (2001). Characterization and *in vitro* antimicrobial activity of 17-β-hydroxy-14,20-epoxy-1-oxo-[22R]-3β-[O-β-d-glucopyranosyl]-5, 24-withadienolide from *VandaRoxburghii*Br. *The Sciences. Pakistan,***1**: 324-326.

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Online ISSN: 2582-368X
www.agriallis.com

Ahmed, F (2002). Antimicrobial Activity of Extracts and a Glycoside from *Vanda roxburghii*R. Br. *Pakistan J. Bio.Sci.,***5:** 189-191.

Ali, A.; Mustafa, A.; Abdulla, S.T.; Hammid, H. and Ali, M. (2003b). A new picoline alkaloid from the pseudobulb of *Desmotrichum fimbriatum* Blume. *Pharmazie,* **58**: 762-763.

Anuradha, V. and Prakasha Rao, N.S. (1994a). Revised structure of flavidinin from *Acampaepraemorsa. Phytochemistry*,**35**: 273-274.

Anuradha, V. and Prakasha Rao, N.S. (1994b). Praemorsin, a new phenanthropyran from *Acampaepraemorsa*. *Phytochemistry*,**37**: 909-910.

Anuradha, V. and Prakasha Rao, N.S. (1998). Aeridin: a new phenanthropyran from *Aeridescrispum*. *Phytochemistry*,**48:**185-186.

Arya. K.R. and Prakash, V. (1999). Ethnomedicinal study of a remote tribal area of Almora district.: A survey report. Part I. *J. Econ. Tax. Bot.,***23**: 247-252.

Asolkar, L.V.; Kakkar, K.K. and Chakre, O.J. (1992). *Second Supplement to Glossary of Indian Medicinal Plants with Active Principles. Par-1 (A-K).* Publications & InformationDirectorate, Council of Scientific & Industrial Research,New Delhi. P 1-414.

Badoni, A.K. (1990). An ethnobotanical study of Pinswari community-A preliminary survey. *Bull Bot. Surv. India,***32**: 103-115.

Ballabh, B. and Chaurasia, O. P. (2007).Traditional medicinal plants of cold desert Ladakh-used in treatment of cold, cough and fever. *J. Ethnopharmacol,* **112:** 341-349.

Ballabh, B. and Chaurasia, O.P. (2006). Ethnobotanical studies on Boto tribe in Ladakh. *Ethnobotany*,**18:** 87-95.

Banerjee, A.K. and Banerjee, I. (1986). A survey of the medicinal plants in Shevaroy hills. *J. Eco. Tax. Bot.,*8: 271-290.

Conservation. *Conservation Biology*,**21:** 263-265.

Dressler and Robert,L. (1986). *The orchids: natural history and classification*. Harvard University Press, pp. 16.

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Online ISSN: 2582-368X
www.agriallis.com

Hegde, S. N. "Seed and tissue culture of Cymbidium hybrid–*C iridiodes* x *C. longifolium*." *Arunachal Forest News*,**2**: 64-71.

Kumar, P.K,; Suresh, A. and P. Pushpangadan. "Aphrodisiac activity of Vanda tessellata (Roxb.) Hook exdon extract in male mice." *Indian Journal of Pharmacology*, 32.5 (2000) 300-304.

Misra, S. andMisra,S. (1991). *Orchids of India*. Bishen Singh Mahendra Pal Singh, pp. ill.

Pillon,Y. and Chase,W. (2006). Taxonomic Exaggeration and Its Effects on Orchid

Singh, A. and Duggal, S. (2009). Medicinal orchids-an overview. *Ethnobotanical leaflets***3**(3).

Stewart, J.; Griffiths, M.(1995). *Manual of orchids*. Timber Press, pp. 375.

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# ORNAMENTAL BIRD REARING – ALTERNATIVE SOURCE OF INCOME GENERATION

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Now a day the agro-ecological situation is characterized by a complex, diverse risk prone nature resulting in low production from monocropped agricultural land. In that case, an alternative income path can save the farmers' from loss. Animal husbandry is one of the ways in which a farmer can earn extra income. But most livestock needs green grass, which is not available most of the time, and the price of whole grains is very high. In this context, the cultivation of Ornamental Birds is very profitable, and the cost of food is very low.

Now a day the cultivation of ornamental birds like love birds, budgerigar, cockatiel, java, finch, etc., has become very popular in homestead (cage system) condition. Among them, the cultivation of budgerigar and finch birds is a safe and reliable way.

Monogamous means they spend their whole life with the same partner. Companions attract each other by feeding and tidying up. The upper part of their lips is red, and it covers the lower part. They are usually 4 – 6 inches long and weigh 20 – 25 grams. Naturally, the female lays one egg every two days. Usually, the female birds sit down over the eggs, and the male birds bring food for the female birds. The male bird eats himself and vomits the half-digested food in the bird's mouth. They need a lot of care after the baby is born. They remain blind after birth. In this condition, the mother feeds them and keeps the baby warm. After 10 days, their eyes open. After about 3 weeks, the real hair on the bird comes.

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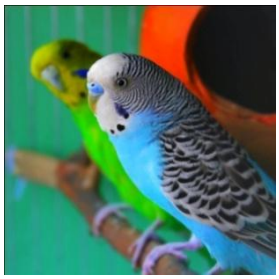


**Budgerigar** **Love Birds** **Finch** **Cockatiel**

## Nature of Ornamental Birds

The following written characters of birds are seen -

1. **Stretching –** They occasionally spread their wings. This improves their blood circulation.
2. **Beak Grinding –** They often make noises on their lips while sleeping.
3. **Preening –** To keep themselves tidy, the birds apply oil substances from the "Preen Gland" at the base of the tail all over the body, making it shiny and good.
4. **Fluffing –** They rub their lips inside the soft hairs while tidying themselves before going to bed or before intercourse.
5. **Hearing & Stredding –** The beaks of these birds are always growing, so they keep rubbing their lips on other things so that they do not grow too much.
6. **Napping –** They usually sleep once a day for 15 to 45 minutes.
7. **Yawning –** Many times, they make gape before or after sleep; it is normal for them.

## Housing System

1. For 100 numbers of birds, a house of 15 feet long, 4 feet wide, and 6 feet high is required.
2. If there is no place to keep a separate birdhouse, then for those who have domestic chickens in their house,

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birds can be kept on the second floor of the chicken house. Birdhouse can also be made attached to the living room. It also provides care and benefits.

3. You have to put straw on the roof of the house.
4. Darma ceiling should be given under the tent.
5. The mold of the tent of the house should be extended up to 3 feet so that rainwater does not enter it.
6. The boundary wall should be up to 1 feet height from the floor.
7. Wire mesh should be provided from 1 feet above the tent. It will be better ventilation.
8. The floor must be paved. When there is a soil floor, the birds start digging the soil floor.
9. The outside of the house should be surrounded by gunny 1 feet away. It will be used to prevent northern air.
10. Some sticks should be hung in the house so that the birds can sit.
11. To clean the house, 300 grams of lime should be spread 1 week before.
12. Phenyl water should be sprayed in the house every 15 days.
13. When keeping birds, if there are insects in the house, 3 ml Butox should be mixed with 2 litter water and sprinkled.

## Clay Clown to Keep Birds

1. You have to pay 1 clown for each pair of birds.
2. A hole about 4 inches in diameter should be placed at the top of the belly of the clown.
3. The distance between the two clowns should be 1.5 to 2 feet.

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## Feeder and Waterer

1. The feeder or feed container should be heavy so that it does not overturn.
2. You have to pay 4 containers for every 100 birds; 500 grams of food should be given in each container.
3. For every 100 birds 2 waterers should be given, which contains a minimum 200 ml of water each.

## **Feed** (For every 100 birds)

1. Every day 1 kg of grain food should be divided into two containers.
2. 50 grams of soaked raw gram should be given.
3. 200 grams of Hincha or Kalmi or Thankuni vegetables should be given per week.
4. Adequate amount of Basil Leaves can be given daily.
5. One day in a week, 150 grams of soaked wheat should be boiled for 15-20 minutes before given.
6. One day in a week, 50 grams of Rice should be given and necessary medicines should be mixed with the Rice.
7. Spread 100 grams of Rock Salt on the floor every week.
8. Red Sand should be given in a container, which will help them in digestion.
9. One pot will contain 100-200 grams of lime.
10. They eat more food when there are chicks in the bird clown. So at this time you have to give more grain food.

## Disease and Treatment

1. Lime Stool – (any one of the following drugs)

   I. Meriquin Liquid – 5 ml once a day mixed with rice for 100 birds for 3 days.

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II. Terramycin Capsule (500 mg) – 1 capsule once a day mixed with rice for 100 birds for 3 days.

2. Boils under the skin – A lot of the time around the eyes, under the jaw, there is a pus-filled wound on the face, in which case the best way is to remove the pus.

3. Feather Cyst – it is usually seen on the wings, but can also be seen on other parts of the body. It can be caused by genes or by hair follicle injury. It can happen again and again if not eliminated properly.

4. Egg retention and egg peritonitis – If the egg gets stuck, the inside of the egg should be removed with a narrow needle. In that case only the shell will be stuck; in that case, if you put calcium in the mouth, it will come out in 2 – 3 days. A many cases, the eggs are stuck, and the oviduct comes out, and the bird dies after drying. A little hot toast is good.

5. Bumble Foot – Many times the soles of the feet become thin and red, this is what happens in bacterial infections. This disease is cured by giving antibiotics.

6. Scaly face and legs – This painful situation is caused by the attack of parasites. They make these fibers and then small holes in the lips. This disease is cured by giving Ivermectin.

7. Worm Infestation – Worms can cause various diseases to the birds, but it is not possible to give worm medicine in time.

## Things to Know

1. Birds should be nurtured as female and male pairs.

2. When buying birds, you have to buy a healthy and strong baby less than 3 months old.

3. To identify males and females, at the age of 3 months, a pink tinge is seen on the lips near the head for females and a blue tinge is seen on the male birds.

4. Lays eggs from 3 months to 2 years of age.

5. Birds should not be kept in pairs after 2 years.

6. The bird lays eggs 3 times a year.

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7. Birds can lay 6 – 8 eggs every time.
8. The baby hatches from the egg in 21 days.
9. If the child is 21 days old, it can be sold.
10. Large birds should be given large grains and small birds should be given small grains.
11. The blood pressure of birds is very high, so if any of their veins and sub-veins is cut, there is a lot of bleeding and it is dangerous. As a result, the blood must be stopped immediately.
12. Injuries can often cause air to build upon the skin beneath the air sac near the chest. In that case, the sir should be vented through a clean needle.
13. To avoid getting cold, 2 tips of Tetracycline Powder for 100 birds should be given mixed with rice 2 days a week.
14. Regularly mix calcium and vitamin together and give 5 ml for every 100 birds.
15. 5 grams of Electrolyte Powder should be given 3 days a week for 100 birds.
16. Liver tonic 3 ml per 100 birds should be given every 15 days interval of 3 days.
17. Albendazole Liquid (Dewormer) should be given 1 drop per bird every 2 months interval from the age of 2 months.

## Conclusion

With the green revolution, now, the Agricultural scenario of India, as well as West Bengal, have achieved to their highest potentiality. Climatic aberrations are also paving its bad effects on the farmer's production and productivity. In these circumstances, alternative livelihood generation in an adoptable, profitable, suitable and sustainable manner through animal husbandry is really praiseworthy and became a hope to the farming fraternity. Appropriate scientific aptitude along with proper marketing may prove this farming to be a future attraction for the upgraded and updated farming community.

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# BIOCHAR: AN ORGANIC SOURCE OF NUTRIENTS

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When a carbon-rich material is exposed to relatively low-temperature heat (<700$^0$c) in the closed oxygen-devoid chamber, the material turns into a porous deep black material known as *biochar*. The process is commonly known as "pyrolysis". When it comes to technical terminology, biochar is produced by thermal decomposition of organic material under restricted oxygen supply. The process of biochar production mirrors the production of charcoal but differs when it comes to heating temperature and level of oxygen present. The other basic difference is that biochar is produced with the prime intention to application in the soil as a method of carbon sequestration and a filtration agent for percolating contaminated water. Biochar is sometimes also get mentioned as 'agrichar'In a normally open condition, burning a carbon-rich material converts into ash which mainly contains minerals such as calcium, magnesium, carbonates, etc. In the normal burning condition, only a small portion is converted to biochar and separation of it from charcoal is physically not possible.

When it comes to differentiating the biochar from charcoal, based on chemical point of view rather than from production point; it's become more difficult due to the fact that there is no universal standard for biochar and a wide variety of biochar can be produced based on a wide variety of biomass and charring process. The main chemical structure of biochar comprised of high carbon content made up with aromatic compounds having a ring structure of six carbon atoms linked together without any Oxygen (O) or hydrogen (H). It has the exact similar structure as graphite but the stacking of sheets. It was Rosalind Franklin who did the characterization of Biochar in the 1940s. Another similar product is 'activated charcoal' which is a biochar type substance which has been activated in various ways which generally increases the surface area. Activated charcoal can be used as an absorbent for agrochemical residues.

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## History

The history of the application of the charcoal-based product is not new and the evidence of its application has been found from various exaction work around the globe. In Brazil, a soil type is known as '*Terra preta de Indio*'contains a very high amount of biochar which proves the fact that the application of biochar is not a new thing. The same type of biochar admixed soil has been found in the Andes zone and Plaggen soils of Europe. The interesting fact is that all these zones do not fall under the same climatic condition hence justifies the fact that the application of biochar was not bound to specific climatic requirement. Because of the anthropogenic and long term effect on soil fertility; '*terra preta*' has garnered the greatest interest. Soil analysis of that area has supported the claim that biochar is very efficient in holding the plant nutrient especially nitrogen, potassium, and calcium along with high moisture content.While it is possible that pyrolysis was first used to make charcoal over 7,000 years ago for the smelting of copper, or even 30,000 years ago for the charcoal drawings of the Chauvet cave (Antal, 2003), the first decisive indication of pyrolysis for charcoal production comes from over 5,500 years ago in Southern Europe and the Middle East. By 4,000 years ago, the start of the Bronze Age, pyrolysis use for the production of charcoal must have been widespread. This is because only burning charcoal allowed the necessary temperatures to be reached to smelt tin with copper and so produce bronze

A range of compounds can be found in the natural environment that is produced by both anthropogenic and non-anthropogenic pyrolysis. These include compounds released from the incomplete burning of petrol and diesel in internal combustion engines.

## Preparation of Biochar

Biochar can be made from a range of biomasses that have different chemical and physical properties. The properties of each biomass feedstock are important in the thermal conversion process, particularly the proximate analysis caloric value, fractions of fixed carbon, and volatile components; percentage of lignin, cellulose, and hemicelluloses, percentage and composition of an inorganic substance, bulk, true density, particle size, and moisture content. The most widely used material for biochar production is bioenergy crops like sugarcane, leaf litters, organic waste such as livestock excreta, crop residue, sewage sludge, etc. Carbonized organic materials can be divided into various groups based on

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torrefaction (low-temperature pyrolysis), slow, intermediate and fast pyrolysis as well as gasification, hydrothermal carbonization (HTC) or flash carbonization used for its production. The most commonly used method for biochar used in agriculture is torrefaction and slow pyrolysis. In this process, the raw materials are heated in an oxygen-devoid Klein powered by thermal or electric sources. Pyrolysis occurs extemporaneously at high temperatures (generally above approximately 300°C for wood, with the definite temperature fluctuating with the material). It takes place in nature when vegetation is exposed to wildfires or comes into contact with lava from volcanic eruptions. At its most extreme, pyrolysis leaves only carbon as the deposit and is called carbonization. The high temperatures used in pyrolysis can persuade polymerization of the molecules within the feedstocks, whereby larger molecules are also produced (including both aromatic and aliphatic compounds), as well as the thermal decomposition of some components of the feedstocks into smaller molecules. During the pyrolysis process,a flammable gas known as *syngas* is also produced which can be further used to provide energy for subsequent pyrolysis cycle which can essentially reduce the fuel cost. Fast pyrolysis is only possible when the moisture content of the material is less than 10%. The material should be further grounded into a 2mm sieve size for rapid reaction and burning. During the pyrolysis process, Cellulose and lignin undergo thermal degradation at a temperature ranging between 240-350'c and 280-500'c respectively. The relative proportion of each component will, therefore, determine the extent to which the biomass structure is retained during pyrolysis at any given temperature. It has been found that plants with the highest lignin content produce more biochar yield. The majority of mineral content remains within the biochar even after the pyrolysis process; this is even true if the silica content is high (rice straw contains around 170 g/kg silica). It indicates the fact that the surplus rice straw of north western rice-wheat belt can be effectively used for biochar production.

**Table.1:** quantity proportions of nutrients (g/kg) in feedstocks

| Material | Ca ( g/kg) | Mg (g/Kg) | K (g/kg) | P (g/ Kg) |
|---|---|---|---|---|
| **Wheat straw** | 7.70 | 4.30 | 2.90 | 0.21 |
| **Rice straw** | 6.9 | 4.7 | 2.3 | 0.20 |
| **Maize cob** | 0.18 | 1.70 | 9.40 | 0.45 |
| **Maize stalk** | 4.70 | 5.90 | 0.03 | 2.10 |
| **Forest residue** | 130 | 19 | - | - |

Source: Chan and Xu (2009)

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## Weed management and Biochar

Weed infestation is a major menace which accounts for around 45% of the total agricultural loss. Although in general condition weed may be considered as totally unwanted but it can be turned into useful biochar. Some weeds are very well known for their capacity to accumulate specific nutrients; converting them into biochar and further application of them into the agricultural field will ensure the close nutrient cycle. As for example,*Chenopodium album* is a very good accumulator of potassium while *Setaria lutescens* accumulate a high level of zinc (585 ppm). Converting weeds into biochar can achieve dual target i.e., weed control as well as returning valuable micro nutrient to the land.

**Table.2:** Physical properties of biochar (<0.50 mm size) from different weed species

| S. No. | Biochar component | Recovery (%) | Bulk Density ($mg/m^3$) | Particle Density($mg/m^3$) | Pore space | Available moisture (%) |
|---|---|---|---|---|---|---|
| **1.** | *Lantana* | 28.5 | 0.37 | 1.25 | 70.37 | 38.9 |
| **2.** | *Dodonia* | 26.1 | 0.50 | 1.00 | 50.00 | 23.9 |
| **3.** | *Eichornia* | 35.6 | 0.38 | 2.50 | 84.62 | 42.0 |
| **4.** | *Prosopis* | 40.0 | 0.36 | 1.25 | 71.43 | 43.3 |
| **5.** | *Melia* | 35.0 | 0.42 | 1.67 | 75.00 | 44.9 |

**Table.3:** Chemical properties of biochar (<0.50 mm size) from different weed species

| S. No. | Biochar component | EC (dS/m) 1:5 | pH (1:5) | CEC (cmol (p+)/kg) | N (%) | P (%) | K(%) |
|---|---|---|---|---|---|---|---|
| **1.** | *Lantana* | 4.07 | 10.29 | 18.0 | 0.923 | 0.0.390 | 1.797 |
| **2.** | *Dodonia* | 1.50 | 9.10 | 13.8 | 0.426 | 0.100 | 0.194 |
| **3.** | *Eichornia* | 7.50 | 10.38 | 23.8 | 1.421 | 0.671 | 3.096 |
| **4.** | *Prosopis* | 3.03 | 9.80 | 18.8 | 1.03 | 0.160 | 1.226 |
| **5.** | *Melia* | 2.93 | 9.94 | 23.0 | 0.848 | 0.199 | 1.670 |

**Table.4:** Micro nutrient content of biochar (<0.50 mm size) from different weed species

| S. No. | Biochar component | Zn ( **µg/g)** | Fe ( **µg/g)** | Cu ( **µg/g)** | Mn ( **µg/g)** |
|---|---|---|---|---|---|
| **1.** | *Lantana* | 33.9 | 760.0 | 21.2 | 79.2 |
| **2.** | *Dodonia* | 13.4 | 418.5 | 13.4 | 46.1 |
| **3.** | *Eichornia* | 85.5 | 5089.0 | 20.2 | 449.3 |
| **4.** | *Prosopis* | 14.4 | 526.3 | 19.1 | 39.6 |
| **5.** | *Melia* | 24.7 | 3246.8 | 25.0 | 188.0 |

Source: Sellamuthu *et. al.* (2018).

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Various research conducted in the past indicates that various allelochemicals (such as ambrosin in Parthenium) lost during the pyrolysis process. Moreover, soil microbial biomass carbon also increases with an increased dose of biochar.

## Biochar Application Method

The way biochar is applied to soils can have a considerable impression on soil processes and functioning, including facets of the behavior and fate of biochar particles in the soil and the wider environment. In the case of topsoil incorporation; biochar can be applied on its own or combined with compost or manures. The cultivation techniques influence the degree of mixing. In case of the conventional tillage system; the biochar should be homogenously thoroughly mixed with the top soil. Being lighter in weight the biochar dust particle is very much prone to wind and water erosion hence it is always better to place the biochar in the root zone. This method is often referred to as 'deep- banding'.

## GHG mitigation through Biochar

The charcoal formation pathway is known for sequestering atmospheric carbon into the terrestrial reservoir via stabilization of short term cycling biogenic carbon into long term carbon pool. The Upper 100 cm surface soil of Earth contains around 1200-1600 Gt global organic carbon pool which has massive sequestration potential as if we consider the global emission of $CO_2$carbon from the combustion of fossil fuel which is around 270 Gt since 1850 to 2000.

## Effect of Biochar

The biochar contains over 95% of micropores within it which can effectively store plant available water. Biochar also changes the soil color; various literature indicates that the Munsell value to decrease from 5.5 to 4.8. The darker color results in less albedo. The modeling approaches indicate that the large scale application of biochar in a wide area can even intensify the monsoon. It also helps in plant establishment during the winter season. Biochar has seven times larger external surface area than the internal surface area, hence it has better CEC. As biochar is neutral to alkaline in nature; it can be effectively used as a liming material. Several experiments also indicate that the application of biochar may lead to decreased nutrient leaching. Biochar directly contributes to nutrient adsorption through charge or covalent interactions on a high surface area.

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## Conclusion

Biochar is improves the soil physical proeprties as well as soil processes. It can be incorporated directly into the top soils or may be mixed with farmyard manure or compost and applied to the soil. Biochar is an important sources of nutrient which provides the nutrients for improvement of soil fertiltity. It also helps in mitigation of GHG by carbon sequestration in the soil. Keeping in view all the physcial and chemical properties of biochar it may be recommended to the agriculture for optimum utilization and benefits.

## References

Joseph, S., Downie, a., Chan, K. Y., Van Zwieten, L., & Meszaros, I. (2007). Agronomic values of greenwaste biochar as a soil amendment. *Australian Journal of Soil Research*, *45*(8), 629.

Ladygina, N., & Rineau, F. (2013). *Biochar and Soil Biota Preface*. *Biochar and Soil Biota*. https://doi.org/BOOK_DOI 10.1201/b14585

Lehmann, J., Rillig, M. C., Thies, J., Masiello, C. A., Hockaday, W. C., & Crowley, D. (2011). Biochar effects on soil biota - A review. *Soil Biology and Biochemistry*, *43*(9), 1812–1836. https://doi.org/10.1016/j.soilbio.2011.04.022

Li, Z., Unzué-Belmonte, D., Cornelis, J. T., Linden, C. Vander, Struyf, E., Ronsse, F., & Delvaux, B. (2019). Effects of phytolithic rice-straw biochar, soil buffering capacity and pH on silicon bioavailability. *Plant and Soil*. https://doi.org/10.1007/s11104-019-04013-0

Rehman, M., Liu, L., Bashir, S., Saleem, M. H., Chen, C., Peng, D., & Siddique, K. H. (2019). Influence of rice straw biochar on growth, antioxidant capacity and copper uptake in ramie (Boehmeria nivea L.) grown as forage in aged copper-contaminated soil. *Plant Physiology and Biochemistry*, *138*, 121–129. https://doi.org/10.1016/j.plaphy.2019.02.021

Roy, S., Kumar, U., & Bhattacharyya, P. (2019). Synthesis and characterization of exfoliated biochar from four agricultural feedstock. *Environmental Science and Pollution Research*. https://doi.org/10.1007/s11356-018-04117-7

Sellamuthu, K. M., Suryia, S., Duraisami, V. P., Mahendran, R., & Venkatachalam, P. (2018). Characterization of Biochar from Different Sources of Plant Communities. *Int.J.Curr.Microbiol.App.Sci*, *7*(3), 891–898. https://doi.org/10.20546/ijcmas.2018.703.104

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Taylor, P., Pandit, B. H., Ghimire, A., Pandit, N. R., Shackley, S., & Cornelissen, G. (n.d.). Making biochar in soil pit kilns. *Ithaka IIstitute for Carbon Intelligence*, 35. Retrieved from http://www.ithaka-institut.org/ithaka/media/doc/1433575787400.pdf

Verheijen, F., Jeffery, S., Bastos, A. C., van der Velde, M., & Diafas, I. (2010). *Biochar application to soil - A Critical Scientific Review*. *Biochar for environmental*. https://doi.org/10.2788/472

Woolf, D., Amonette, J. E., Street-Perrott, F. A., Lehmann, J., & Joseph, S. (2010). Sustainable biochar to mitigate global climate change. *Nature Communications*, *1*(5), 1–9. https://doi.org/10.1038/ncomms1053.

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# HOMEGARDEN: IN THE URBAN PARTS OF TRIPURA

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The homegarden is a small-scale production system supplying plant and animal consumption and serviceable items which is either not affordable, obtainable, or readily available in the retail markets. A household garden tends to be located close to the abode for security, expediency, and special care. In home gardens, ecologically adapted and complementary species are featured, which are marked by low capital input and simple technology. Home gardens can be described as a mixed cropping system that encompasses vegetables, fruits, plantation crops, spices, herbs, ornamental and medicinal plants as well as livestock that can serve as a supplementary source of food and income. Homegardens are found in both rural as well as urban areas in primarily small-scale subsistence agricultural systems. The subsistence agricultural production systems which began in small garden plots around the household a long ago have persistently endured playing an important role in providing food and income for the family.

Tripura is a small piece of land in the North-Eastern part of India where homegardening has been a long standing practice among the rural and urban households for centuries. There has a considerable difference between homegarden practices in rural and urban areas of Tripura, particularly with the plant diversity and species richness. Agartala and its peripheral localities are semi-urban to urban in nature where peoples also show certain degrees of interest in homegardening. However, the practice of homegarden is diminishing day by day in the urban parts of the state.

## Characteristics of Homegardens

There have few characteristics of homegardens:

1) Are located near the residence;

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2) contain a high diversity of plants with multiple strata;
3) Production is supplemental rather than a main source of family consumption and income;
4) Occupy a small area; and
5) Are a production system that the poor can easily enter at some level.

## Experiences of Home Gardens from Developing Countries

Homegardens have been an integral part of the local source of food in developing countries around the world. Several shreds of evidence and analysis of homegardens in developing countries in Asia, Africa, and Latin America show their numerous benefits to communities and families. Even though homegardens are mainly intended to produce food items only for family consumption, but they can be diversified to produce outputs that have multiple uses, including indigenous medicine and home remedies for certain diseases, kindling and alternative source of fuel, manure, building material, and animal feed. Sometimes homegardens are referred as a 'place for innovation' because of its potential to improve the livelihood of semi-urban and rural communities. In addition to the above-mentioned benefits of homegardening, it can broadly be categorized into three components: (1) social; (2) economic; and (3) environmental benefits.

## Social Benefits

### *Enhancing food and nutritional security*

The most fundamental social benefit of homegardens stems from their direct contributions to household food security by increasing availability, accessibility, and utilization of food products. Homegardens are maintained for easy access to fresh plant and animal food sources in both rural and urban locales. For poor and marginalized families unable to afford expensive animal products to fulfill their nutritional needs, homegardens offer a cheap source of nutritive foods. Furthermore, the integration of livestock and poultry activities into homegardening reinforces food and nutritional security for the families as milk, eggs, and meat from home-raised animals provided the main and, in many instances, the only source of animal protein (de la Cerda and Mukul, 2008).

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***Improving health***

Plants are an important source of medicine for humans and livestock and are used as biological pesticides to protect crops from diseases and pest infestations. Herbs and medicinal plants are grown in homegardens all over the world, and in developing countries, nearly 80% of the people use them to treat various illnesses, diseases and also to improve their health conditions (Rao and Rao, 2006). A generous portion of the plants found in homegardens have some medicinal value and can be used to treat many common health problems cost-effectively.

***Uplifting the status of women***

Women's participation and responsibilities in homegardening vary across cultures, including land preparation, planting, weeding, harvesting, and marketing. Maximum homegardens are chiefly managed by the women members of the family, which is a positive sign in terms of 'women empowerment. Regardless particularly for women and disadvantaged groups, homegardening is an opportunity for social and economic enrichment. For some women, sales of garden products are often the only source of income or livelihood.

***Preserving indigenous knowledge and building integrated societies***

The rich communal knowledge and indigenous culture is expressed through homegardening, by the selection of plants and animal components as well as the farming practices used by the local communities. Homegardeners usually exchange or gift planting materials, vegetables, fruits, leaves, herbals and medicinal plants for social, cultural, and religious purposes. Such kind of interaction is very much essential for social integration and constructing social capital.

## Economic Benefits

Homegardens contribute to income generation, improving livelihoods, and household economic welfare as well as promoting entrepreneurship and rural development. Income generated from the sale of fruits, vegetables, and livestock products allows households to procure additional food items as well as for savings, education, and other services. In many cases, the sale of produce from homegardens improves the financial status of the family, providing additional income while contributing social and cultural amelioration.

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## Environmental Benefits

Homegardens provide various environmental and ecological benefits. While conserving biodiversity and natural resources, they serve as the primary unit that initiates and utilizes ecologically friendly approaches for food production. Homegardens also contains some of the rare or threatened species thus they become ideal sites for in situ conservation of biodiversity. Homegardens also provide a number of ecosystem services such as habitats for animals and other beneficial organisms, nutrient recycling, reduced soil erosion, and enhanced pollination. In homegardens organic fertilizers and organic wastes are being used, which is a positive step towards organic farming.

## Home Garden in Context to Tripura

Homegardens of Tripura are playing a significant role in food, nutritional security and livelihood of the peoples of rural as well as urban areas. Tripura is a small state with a diverse demographic composition. People of various communities show a keen interest in homestead-based agroforestry. In maximum families, the members spend an ample amount of time in homegardening activity. Regardless of communities, maximum homegardens are chiefly managed by the female members of the house in this state. Homegardens of Tripura is a rich repository of vital plant species that include medicinal plants, vegetable crops, fruit crops, spices and timber-yielding tree species. People also get a significant portion of fodder from the trees of their homegardens. Recent studies have revealed a significant species richness and plant diversity in the homegardens of Tripura (Das *et al*., 2020). Homegarden is also playing a vital role in maintaining the economic condition of rural people by providing some economic outputs and also by providing them some of the necessities.

## The Declining Trend of Homegardening in the Urban Parts of Tripura

Even though homegardens provide multiple benefits both directly and indirectly to the peoples without any major investment, still in urban localities these practices are getting less importance. A recent study revealed declined tendency towards the practice of homegardening in urban parts of Tripura (Das *et al*., 2020). Homegardens of these areas of Tripura are much smaller in size and possess a lesser plant species richness and diversity. The possible reasons may be low land availability, the divergence of people's tendency from

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agricultural activities, availability of other comfortable livelihoods, less availability of skilled agriculture workers and busy life schedule of urban people.

This tendency of the people of the urban part of Tripura is making those areas less green. One fact is often forgotten that a tree outside the forest also provides similar ecological functions. So, plant species, especially the trees of homegardens, act as a carbon sink and provides all other benefits. So, utilizing the available spaces in the home yards to practice homegardening in the urban areas can be a positive step against pollution and global climate change.

However, homegardens of both rural and urban areas of the state are providing some income and employment opportunities, as 'unemployment is a burning issue in Tripura nowadays.

## Conclusion

In the wake of a global food crisis and high food prices, increased emphasis has been made on enhancing and building local food systems. In this perspective, there is improved attention to the inclusion and promotion of homegardens as an eco-friendly sustainable agricultural practice to improve food security and enhance economic growth. Also, encouraging urban people to practice homegardening incorporating avenue and timber yielding trees will surely be a constructive step towards biodiversity improvement, carbon sequestration, and climate change mitigation.

## References

Das, S. K., Deb, S., and Debnath, B. (2020). Assessment of plant diversity in homegardens of rural and urban areas of Tripura, North-East India. *Indian Journal of Agroforestry*, *22*(2), 71-79.

de la Cerda, H. E. C., and Mukul, R. R. G. (2008). Homegarden production and productivity in a Mayan community of Yucatan. *Human Ecology*, *36*(3), 423-433.

Rao, M. R., and Rao, B. R. (2006). Medicinal plants in tropical homegardens. In *Tropical Homegardens* (pp. 205-232). Springer, Dordrecht.

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# XERISCAPING (LOW WATER USE LANDSCAPING)

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Modern lifestyle has changed the styles of present gardening. Conventional landscaping is shifted to a new change like roof gardening, vertical gardening etc. Xeriscaping, the new technology, is more pronounced than other types of gardening. The term Xeriscape is derived from the Greek word "Xeros," meaning dry, and "Scape" from the word "Landscape". Xeriscaping (low water use landscaping) is defined as a creative and method of landscaping that focuses mainly to conserve water, using drought tolerant and native plants that are adapted to hot, dry climates, in conjunction with water saving techniques. This idea of Xeriscape originated with the Denver Water Department. Xeriscape encourages the use of native plants, of drought tolerant plants, and other related principles, such as the use of mulches, efficient irrigation systems, soil analysis, and maintenance (Georgiou, 2002).

Xeriscaping (often incorrectly spelled zero-scaping or xeroscaping). It is promoted in regions that do not have easily accessible, plentiful, or reliable supplies of fresh water and is gaining acceptance in other areas as access to water becomes more limited. In some areas, terms such as water-conserving landscapes, drought-tolerant landscaping, and smart scaping are used instead. Plants whose natural requirements are appropriate to the local climate are emphasized, and care is taken to avoid losing water to evaporation and run-off. The specific plants used in xeriscaping depend upon the climate. Xeriscaping is different from natural landscaping, because the emphasis in xeriscaping is on the selection of plants for water conservation, not necessarily selecting native plants.

## How Does Xeriscaping Differ From Conventional Landscaping?

- It is a method of Landscaping, not a style of landscaping.
- It groups plant with similar moisture requirements together in watering zones.

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- It promotes a greater the use of native plants, thereby increasing the water savings.
- It restricts higher water-use plants to areas where they will serve a purpose.
- It could save 25% to 50% in outdoor water use, depending on your previous water use habits.
- The initial costs for xeriscape will probably be slightly higher due to cost of plant material.
- The savings in irrigation and maintenance makes it cost-effective in a few year.

## Seven principles for Successful Xeriscaping are

1. Plan and design
2. Improvement of soil.
3. Limit turf areas.
4. Use appropriate plants
5. Water efficiently.
6. Use of mulch.
7. Maintain appropriately

## 1. Plan and Design

Success of any landscape garden depends mainly on planning and its execution. So, proper planning and design can create a beautiful xeriscape garden in front or backyard of our home. While designing three elements should be kept in mind i.e. Sun, View/function and time. By knowing sun, we can place plants i.e. some requires full sunny situation, while others require partial shade or shady areas. Function/view is so important and helps in designing. If the reason of landscaping is for shade then large trees and shrubs should be planted without obstructing any view, if it is for aesthetic point then, plants need to be selected that will grow to the desired height and density to fulfill this purpose. If the purpose of landscaping is offer for attractive colour then trees with different bloom should be selected for planting. Time is the third element which can be successfully fulfilled that completely depends on resources and planting material we used. Select plants that are self sustainable so that it requires minimal human interventions and maintenance.

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## 2. Improvement of Soil.

Xeriscaping mainly focuses on conserving water, so prior soil analysis is important to help determine whether soil improvement is needed for better water absorption, improved water-holding capacity and proper plant selection for xeriscape area. One should spread a layer of organic matter 7.6-10 cm (3-4 in.) thick on the surface of the soil to be improved and then thoroughly incorporate the organic matter into the existing soil. However, incorporating organic matter is not necessary for large turf grass areas and is not economically feasible. Also, for native plants, soil amendment may not be necessary, but it is necessary to loosen the soil.

## 3. Limit Turf Areas

Turf provides a play area for the yard. It also controls erosion and absorbs heat, cooling the environment around it. In a xeriscape garden, it is always recommended to reduce the lawn areas and turfing shouldn't be done in impractical areas such as long and narrow areas or odd-shaped areas. Grasses which are more drought tolerant are selected, Buffalo grass and Bermuda grass are the recommended type of grasses for Xeriscape gardens but may cost more than other turf grasses. Put turf to practical, efficient use. Choose low water use grasses. Lawns are no longer used to measure one's wealth by the size of the lawn. Limit lawn areas to reduce water use and maintenance. Enlarge your beds to reduce water use**.** (Hessling, 2001)

## 4. Use Appropriate Plants

Select the plants which are conducive to native and fit the specific purpose of the landscaping. After selection, these are grouped according to their water requirement since xeriscape focuses mainly on minimizing the resources. Plant selection should be based on the intended use in the landscape. Use of more plants with low water needs and native plants will allow maximum water conservation.

**Table 1**. Plants for Xeriscape Garden

| Trees | Shrubs |
|---|---|
| Golden rain tree (*Koelreuteria paniculata*) | Yucca (*Yucca spp.*) |
| Burr oak (*Quercus macrocarpa*) | Heavenly Bamboo (*Nandina domestica*) |

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| | |
|---|---|
| Japanese Pagoda tree (*Sophora japonica*) | Junipers (*Juniperus spp.*) |
| Red Maple (*Acer rubrum*) | Glossy Abelia (*Abelia x grandiflora*) |
| Red Cedar (*Juniperus virginiana*) | Cotoneaster (*Cotoneaster spp.*) |
| Japanese Tree Lilac (*Syringa reticulata*) | Rock Spiraea (*Holodiscus dumosus*) |
| **Vines** | **Ground Covers** |
| Honey suckle (*Lonicera japonica*) | Algerian Ivy (*Hedera algeriensis*) |
| Star Jasmine (*Tracheolosporum jasminiodes*) | Asiatic Jasmine (*Trachelospermum asiaticum*) |
| Clematis (*Clematis paniculata)* | Creeping Juniper (*Juniperus horizontalis*) |
| Virginia Creeper (*Parthenocissus quinquefolia*) | Wedelia (*Sphagneticola trilobata*) |
| **Grasses** | **Annuals** |
| Buffalo grass *(Bouteloua dactyloides)* | Day Lily (*Hemerocallis*) |
| Bermuda grass (*Cynodon dactylon*) | Candy Tuft (*Iberis sermpervirens*) |
| Zoysia grass (*Zoysia japonica)* | Iceland Poppy (*Papaver nudicaule*) |
| Tifway419 (*Cynodon dactylon*) | Goldenrod (*Solidago spp.*) |
| St. Augustine (*Stenotaphrum secundatum)* | Coreopsis (*Coreopsis verticillata*) |

**Source:** Xeriscaping and Conserving Water in the Landscape. *Home and Garden Information Center*. University of Maryland.

### 5. Water Efficiently

Properly planned irrigation facilities can greatly improve the water usage and reduce the water wastage. Grouping of plants into similar zone of irrigation is a key to irrigation plants wisely. Sprinkler (Permanent and hose end) and Drip irrigation systems are recommended in xeriscape garden. Usually the permanent sprinkler system is more water-efficient than the hose-end sprinkler. For grass, low-pressure, low-angle sprinklers irrigate best. The second irrigation method, drip irrigation, offers increased watering efficiency and plant performance when compared to sprinkler irrigation. It is better to water deeply and infrequently to develop roots. The best time to water is between 9 p. m and 9 a.m.

### 6. Use of Mulch

In Xeriscapes, the use of mulch to cover the soil around woody and perennial herbaceous plants provides several benefits to the planting areas. Mulches are beneficial in many ways helps to minimize evaporation, reduces weed growth, slows erosion, prevents soil

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temperature fluctuations and Decomposes slowly adding nutrients to soil. Best mulches are organic because they can be recycled and also offer the benefit of regenerating the soil with nutrients during decomposition. Don't use plastic mulch they collect excessive moisture under the mulch and increase the waterlogged condition and death of plants.

### 6. Maintain Appropriately

Maintenance is required in all landscape gardens, even in low landscapes. It is necessary to keep xeriscape healthy by well-timed mowing, proper fertilizing, properly timed pest control, avoid mechanical damage, and periodic checks of irrigation system. A little maintenance on the front end will save time, money, and resources in the long run and will lead to some great looking landscapes.

### Advantages

- Lowered consumption of water
- Reduce Maintenance
- Reduced waste and pollution

### Disadvantages

- It may not meet modern aesthetics
- Initial Cost is high
- Reduced areas for sports

### Conclusion

Xeriscape provides beautiful, healthy and hospitable environment for the people with low water usage and reduced maintenance for the gardeners.

### References

Raymond Bosmans. (2001). Xeriscaping and Conserving Water in the Landscape. *Home and Garden Information Center*. University of Maryland.

http://www.salinaks.gov/filestorage/18184/18599/19512/19528/PLF112XeriscapingInformation.pdf.

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Online ISSN: 2582-368X
www.agriallis.com

Hessling M. (2001). Turf landscapes versus xeriscapes: Analysis of residential landscapes in the Las Vegas Valley, Nevada. 156-421.

Georgiou G. 2002. Xeriscape guidelines adapted to residential gardens in Cyprus. *B.S. University of New Orleans*, 4(2), 70-130.

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# CLIMATE RESILIENT AGRICULTURE: THE NEED OF HOUR

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India is a country whose mass proportion of the population depends on agriculture. At present, climate change has become an important issue in agriculture to ensure food and nutritional security for a continuously growing population. Climate change has its impact at the global level, but some of the countries like India; are more vulnerable in terms of the huge population depending largely on the agriculture sector. The Government of India has accorded high priority for research and development to cope-up with climate change in the agriculture sector.

Climate-resilient agriculture (CRA) is an approach which includes the sustainable use of existing natural resources through crop and livestock production systems to achieve long-term and higher productivity along with farm incomes under climate variabilities.

"Climate change is already affecting agriculture and food security" (FAO Report, The State of Food and Agriculture, 2016). Without urgent action, millions & more people will be at a high risk of hunger and poverty.

Climate resilience is a fundamental concept of managing the risks of climate change. In this context, resilience refers to the ability of an agricultural system to anticipate, absorb,

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prepare for as well as adapt to and recover from the impacts of changes in climate and extreme weather conditions.

## The Need for Climate Resilience

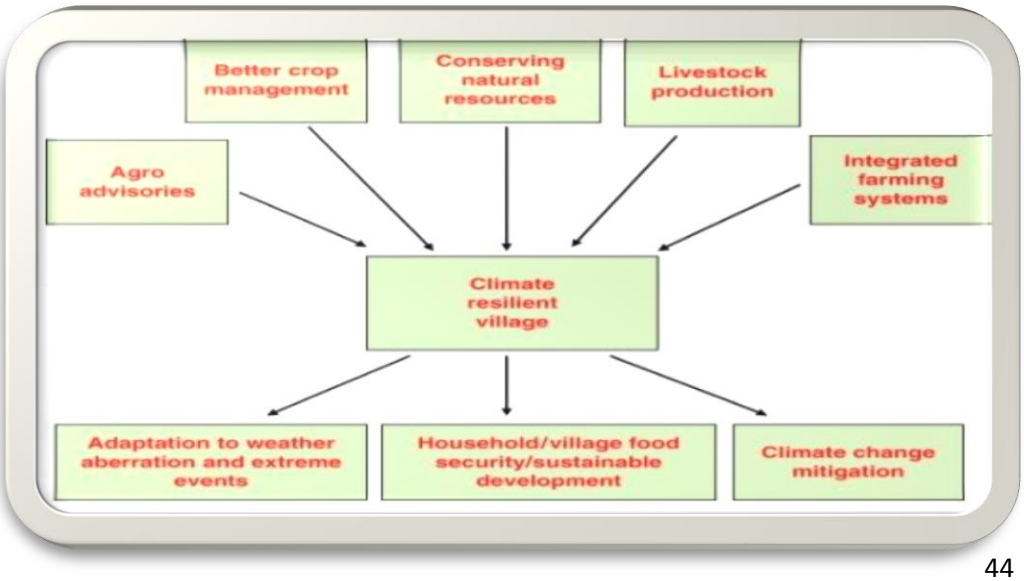
Climate related hazards are having a big impact on the lives of people, especially the poor. Extremely heavy rainfall or hardly any rain at all on the other side, rise and fluctuations in temperature, sudden hailstorms & frequency of droughts, floods & storms are happening with uncertainty and this is expected to increase further in future.

The impact of these climatic conditions are felt severely especially in developing countries with less food and water security as well as loss of livelihoods. In this situation, survival becomes a real struggle. Promoting climate resilient agriculture in the areas which are severely affected by climate change is needed to safeguard food security and also a decent income for rural communities.

In the coming decades, climate change is expected to further exacerbate the risk of disasters. The more frequent, intense storms & floods and long-lasting droughts can erode the existing community coping capacities to prepare for, respond to and recover from successive hazardous events.

Keeping and viewing all these things it seems the need of hour that farmers and agriculturalists are enabled to apply agricultural practices that make them more resilient to climate change.

## Climate Resilient Practices




Different Components and Climate Resilient Practices

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## 1. Cropping System

- The crop varieties with high heat tolerance or optimal heat range should be promoted. *e.g.* (Quinoa, pearl millet, sorghum *etc*.)
- The mechanisms should be adopted to reduce the effect of heat stress at the key phenological phases (germination & flowering) through short cycle varieties.
- Optimize crop calendars through historical climate data and seasonal forecast support for decision making.
- Use of fire breaks (rock walls, roadways, high moisture and low resin plants), windbreaks, frost protection (plant row covers, mulching, wind machines) & Agroforestry.
- Agronomic practices like weeding and defoliation reduce transpiration, cover crops reduce soil erosion, mulching with no-tillage reduces the exposure of crops to heat stress conditions.
- Drip irrigation systems, programmed irrigation, small-scale reservoirs & re-use of wastewater helps in drought management.
- Biological control like the use of natural enemies, crop rotation, use of bio-pesticides, and integrated pest management (IPM) helps in pest and disease management.

## 2. Livestock System

- Adapted cattle breeds with heat tolerance, switching to livestock species (camel, sheep & smaller animals) for drought and heat management.
- Rotational grazing, reduced herd size, cut and carry fodder systems are used to prevent land degradation.
- Use of manure for biogas production shorten the storage time at farms, and biological control helps in greenhouse gas minimization.

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### 3. Forest System

- Use of forest inventory, controlled timber harvesting, veld management, payments for economic services (preserve natural resources, wild-life biodiversity) help to prevent forest degradation.
- Reforestation, regeneration & aforestation; such practices prevent land degradation and helps in greenhouse gas minimization.
- Sustainable forest management for soil and water conservation, change of species and selection of traits accordingly for the drought management.

### 4. Biodiversity

- Promotes ecosystem based adaptation and nature-based solutions, including eco-system restoration and rehabilitation.
- Supports the preservation of germplasm and living genetic resources maintained for the purpose of animal and plant breeding.
- Develop applied remote sensing and modeling for biodiversity monitoring and analysis.
- Enhances forest connectivity by promoting habitat corridors and through reforestation, removing barriers for dispersal and locating reserves close to each other; mitigates other threats for *e.g.* invasive species, fragmentation and pollution *etc*.
- Initiate long term studies of species response to climate change.
- Translocate species to the most suitable environments that depends on physiological and demographic factors.

## Smart Practices and Technologies for Climate Resilient Agriculture

1. Fodder cultivars to tackle fodder scarcity.
2. Integrated Farming System (IFS) modules.
3. Rainwater harvesting and recycling through temporary check dam.
4. Management practices to tackle cold stress in backyard poultry.

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5. Captive rearing of fish seed as a livelihood opportunity in flood prone areas.
6. Drum seeding of rice for water saving and timely planting.
7. Direct seeded rice for promoting water use efficiency.
8. Drought tolerant paddy cultivars to tackle deficit rain fall situations.
9. Small farm mechanization through 'Custom Hiring Centres' for farm machinery.
10. Village level seed banks to combat seed shortages.
11. Flood tolerant varieties to impart resilience to farmers in flood-prone areas.
12. Short duration crop varieties suitable for late sowings.
13. Zero till drill wheat to escape terminal heat stress.
14. Enhancement of resilience through improvement in conveyance efficiency.

## National Initiative on Climate Resilient Agriculture

ICAR launched a 'National initiative on climate resilient agriculture' during 2010-11. The initiative primarily enhances the resilience of Indian agriculture covering crops, livestock, and fisheries.

## Objectives of NICRA

1. To promote the research for the improvement in production system and risk management to enhance the climate resilience in 'Indian agriculture'.
2. Wide demonstration of technologies directly at farmer's field to enable the vulnerable districts in coping with climate change.
3. Capacity building of scientists and other stakeholders in climate resilient research.

## Different Components of the Project

There are basically four components of the scheme which are as follows:

- Strategic research on adaptation and mitigation.
- Technology demonstration at farmers' field to cope-up with current climate variations.
- Capacity building of different stake holders.
- Sponsored competitive research to fill the critical gaps.

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## Future Prospects

- Reduction in the green house gas emissions from all agricultural and non-agricultural sources should have to be prioritised. The introduction of Neem-coated urea is one of such policy interventions.
- Structured training programs should be organized on priority basis to build-up confidence among the stake-holders and sensitise them to understand the climate change events and their impact.
- Fine tuning of the gap between current management practices and essential agro-advisories.
- Implementing Climate resilient agriculture (CRA) practices; across the country is the need of the hour.
- Collaboration between farmers, research institutions, funding agencies, governments & non-government organisations and private sectors; combine strengths to promote CRA across the nation.
- Flagship farmer-oriented programmes are required to improve the skills used in agriculture and allied sectors.

## Conclusion

India is an agrarian country, and its economy is based on agriculture. Climate change has an immense impact on the agriculture sector. To cope up with changing climatic conditions, it is the need of the hour that we should go for climate resilient agriculture. Climate resilience is a fundamental concept of managing the risks of climate change and climate-resilient agriculture (CRA) is an approach which includes the sustainable use of existing natural resources through crop and livestock production systems to achieve long-term and higher productivity along with farm incomes under climate variations. The farmers and agriculturalists should be trained in such a way that they are enabled to apply agricultural practices which make them more resilient to climate change. The Govt. and non-govt. Organizations should take part and help in implementing Climate resilient agriculture (CRA) practices across the country.

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## References

Climate resilient agriculture through adaptation and mitigation strategies. http://www.nicra-icar.in/

Why India needs climate resilient agriculture system. www.downtoearth.org.in

Climate resilient practices– Food & agriculture organization of United Nations. http://www.fao.org.in

Smart practices and technologies for climate resilient agriculture. http://vikaspedia.in

Promoting climate resilient agriculture for sustainable livelihood. http://www.cordaid.org.in