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The First English farm journal from the house of Kerala Karshakan

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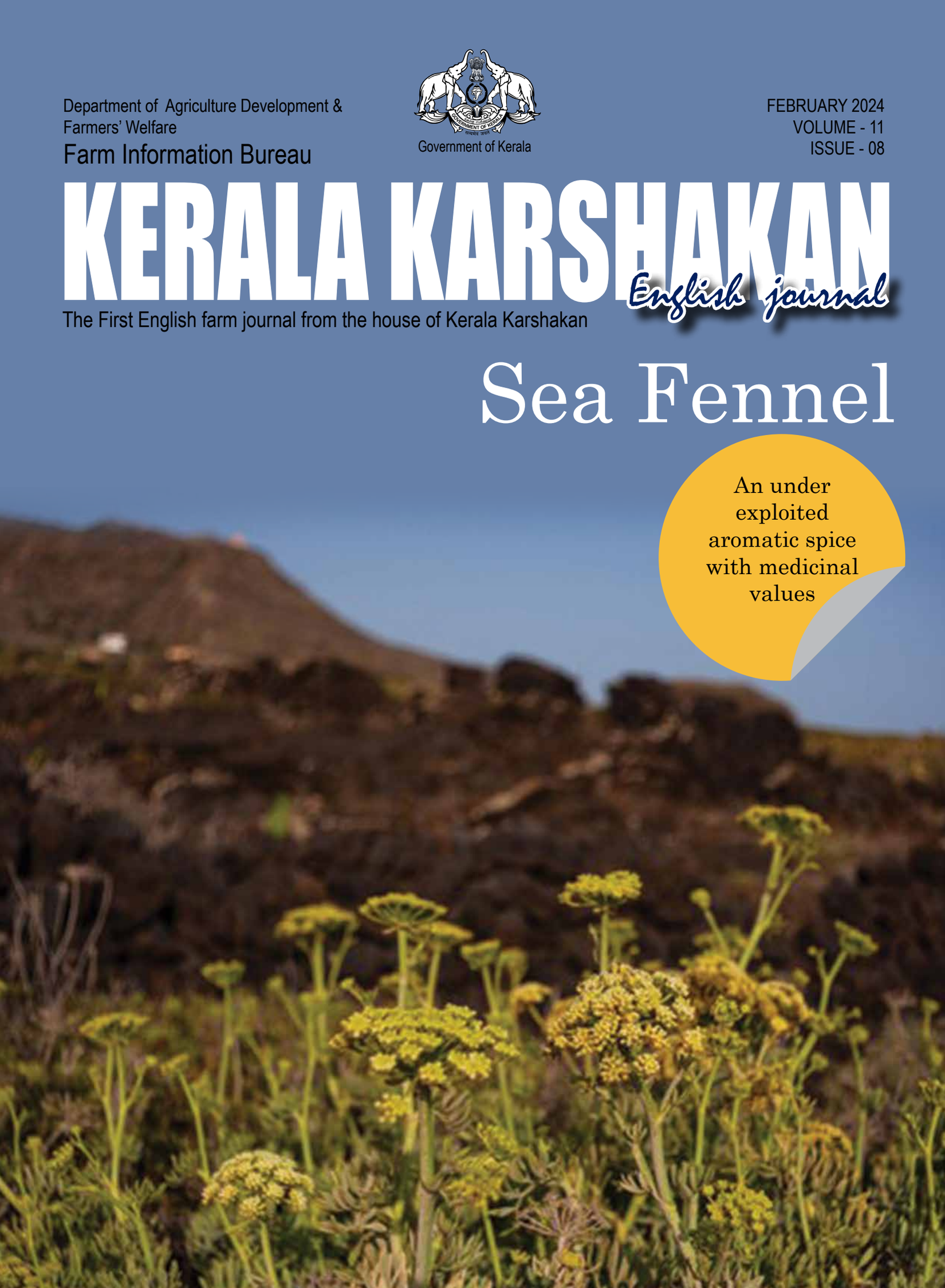
An under exploited aromatic spice with medicinal values



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Sea Fennel

An under exploited aromatic spice with medicinal values

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Sea fennel grown in wild

Introduction

An edible wild plant popularly known as rock samphire as it is mainly found throughout coastal lines of Europe, North America and Mediterranean region. Scientifically it is known as Crithmum maritimum belongs to the family Apiaceae.

History

The use of sea fennel dates back to 17th Century where Shakespeare in Kinglear collected this for the first time. Later during the 19thCentuary spreaded to other countries through sea route to the London market known as Crest Marine.

Parts used	Uses
Fleshy aromatic leaves	Soups, Sauces
Stems, leaves and pods	Salad, Pickled, Salted, spiced vinegar
Others	Traditional food – Italy and Greece
	Decoction – cough and cold – south Italy
	Juice – diuretic , carminative
	Coloring agent in the food industry
	Garnishing pizza and sandwiches
	High essential oil content

Greek Crithmum- krithe, Maritimum	Habitat – Sea Fruit resembles barley – Barley corn
French Fenocil, marin , Criste Italian	marine, Perre-pierr,passepierre Finocchiomarino, Cretamo, Spaccasassi
German	Meer fenchel / see fenchel

other name differs from country to country (Franke 1982; O¨ zcan et al. 2001). Some of them are enlisted as follows:

Description

Perrenial halophyte growing upto 30-60cm height with many branches having succulent pinnate leaves and thick rhizomatous roots (Franke 1982). The flowers are yellowish in colour which blooms from June to September, whereas the fruiting season lies in between October – November (Atia et al. 2011).

Chemical constituents

Phycocyanin

Medicinal properties

- In folk medicine as appetizer, tonic, carminative and diuretic
- The sea fennel was used by sailors during food preparation to protect against scurvy. In Italy, the infusion of shoots harvested before the fructification were used against inflammations of the urinary tract and prostate

Uses

The plant is used mainly in the culinary preparations. It also has many other applications. Such as:

Ethanobotany

The occurrence of sea fennel is found in almost all sea areas. The evolution of its scientific name and also the

- Purgative action while the infusion of leaves has been largely used for the digestive diseases and for renal therapy
- High phenol content, radical scavenging activity, and antimicrobial properties against a large panel of human pathogenic bacteria.

Conclusion

Many underutilized crops are still lacking the commercial usage. Exploitation of this crop could play a better role for making up a sustainable food production system. Studies has to be taken up in a large-scale manner for cultivation of sea fennel. Assessment of the nutritional, colouring agent and functional components is need of the hour. The growth rate is going to be large for naturally derived colours with a predicted annual growth rate of 5-10 %. Because of consumer s choice for natural food processing industry and have contributed to the increase in natural colour market significantly.

Refernces

Atia, A., Barhoumi, Z., Moked, R., Abdelly, C., Smaoui, A., 2011. Environmental eco-physiology and economical potential of the halophyte Crithmum maritimum L. (Apiaceae). Journal of Medicinal Plants Research 5, 3564–3571.

Cornara, L., D'Arrigo, C., Pioli, F., Borghesi, B., Bottino, C., Patrone, E., Mariotti, M.G., 2009. Micromorphological investigation on the leaves of the rock samphire (Crithmum maritimum L.): occurrence of hesperidin and diosmin crystals. Plant Biosystems 143, 283–292.

Cunsolo, F., Ruberto, G., Amico, V., Piattelli, M., 1993. Bioactive metabolites from Sicilian marine fennel Crithmum maritimum. Journal of Natural Products 56 (9), 1598–1600.

Franke W (1982) Vitamin C in sea fennel (Crithmum maritimum), an edible wild plant. Econ Bot 36(2):163–165

Pilu

Underutilized fruit crop of arid region

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The Indian subcontinent is rich in fruit genetic diversity. The climatic conditions range from temperate to tropical making India suitable for a wide range of fruit diversity. There are quite a large number of indigenous and underutilized minor fruit crops, which are used by the local inhabitants. Pilu *(Salvadora persica L.)* is anunderutilized minor fruit crop of arid regions that has multiple uses. Salvadora belongs to the family Salvadoraceae and is a small genus of evergreen trees or shrubs. *Salvadora persica* is commonly known as "Toothbrush

tree, Mustard tree" (English), Miswak, "Jhal", "Chhota "pilu", Kharjal (Hindi), "Perungoli (Tamilnadu) "Arak, " (Arab).

Origin and distribution

It isnative to the Middle East, Africa and India and is distributed in India, Sri Lanka, Egypt, Israel, Pakistan, Sudan, Ethiopia and Senegal. In India,it is found in the arid and semi-arid regions of Rajasthan, Gujarat, Punjab, Haryana, Karnataka, Andhra Pradesh, Tamil Nadu, Madhya Pradesh and Uttar Pradesh.Amongst them, Rajasthan and Punjab are the main states where pilu is very common. These states are also the main collecting centres of pilu seeds with an estimated potential of above 47000 tonnes.

Uses

It is a multipurpose tree with several uses. Fruits are tasty and popular among the locals and the seeds are rich in oil (40- 50%), which is non-edible but has a lot of economic use. It is a good food source for camels and goats. It creates a virtually impenetrable growth through root suckers around the stem and seedlings that come up under the canopy's shade, making it an effective plant for shelterbelts and windbreaks in deserts. It is one of the species that has been identified as having great salt tolerance and drought resistance, and it can be utilized to restore salt-damaged soils.

The whole plant is used medicinally. The root contains salvadourea, m-anisic acid and sitosterol, root bark and stem bark contain trimethylamine and the seed oil is rich in myristic, lauric and palmitic acids.Fruits possess carminative, diuretic and stomachic properties and are used in biliousness and rheumatism,seed oil can be applied on the skin in rheumatism. The root contains steam-distillable oil, which has 90% benzyl isothiocyanate, a compound responsible for decreasing dental caries and used in the preparation of miswak toothpaste. Salvadora persica stick, known as miswak, is popular for teeth cleaning throughout the Arabian Peninsula, Iranian Plateau, as well as the wider muslim world.

Species diversity

In India, two species of the genus Salvadora occur *viz. Salvadora oleoides* Decne and *Salvadora persica L.*

S. persica

Found in the arid and semi-arid regions of Rajasthan and Gujarat. Dominating species in saline and dry environments, including several deserts and arid regions. Fruits are red on maturation, leaves are small and more in number and the seeds contain 30-40% oil rich in lauric and myristic acids used in soap, detergent, candles and the cosmetic industry.

S. oleiodes

It is known as Bada pilu. More numerous and widespread in dry and hot deserts.The tree may be found in abundance in the Jodhpur areas of. Fruits are reddish brown and the seeds contain 47% of lauric acid.

Botanical description

The plant is a shrub or a small tree with a height of 15 to 30 feet, maturing in eight to twelve years. It has a twisted trunk and drooping branches glabrous, terete, more or less glaucous branches, the two opposite branches arising symmetrically at an angle of 450 to the main axis.

The stem is often fissured bark is grey or whitish grey. The leaves are opposite decussate, elliptic-lanceolate or ovate,

obtuse and often mucronate at the apex, somewhat fleshy or coriaceous. Flowers are pedicellate, greenish-yellow in colour, and they are very small in size, arranged in axillary or terminal compound panicles. Pedicels 1.5-3 mm long, bracts beneath the pedicels ovate, caduceus. Calyx is 3-4 in number and less than 1 mm in size,four yellow corollas, stamens arefour and are smaller than the corolla, ovary is bilocular. The fruit is drupe, which is globose, smooth, and red when ripe supported by the persistent calyx and corolla. The seed is 1.4 mm in diameter globose erect smooth and brown.

Soil and climatic requirements

Pilu is well adapted to a wide range of edaphic and topographical conditions. It can tolerate high temperatures, low humidity and high rainfall. It has been found growing both the plains and, in the hills, up to an altitude of 900 m and can tolerate temperatures within a range of -3 to +48°C; mean annual rainfall 180-1000 mm, extreme drought and is hardy browse-tolerant, fire-resistant and wind-firm but rather frost-sensitive.

Pilu grows well in inland non-saline soil to highly saline along the sea coast. Because of its prevalence in non-saline to very saline settings, S. persica was classified as a facultative halophyte. *Salvadora persica* is more salt tolerant than *Salvadora oleiodes*. It is a perennial halophyte that stores the excess salt in its leaves. However, the excess sodium and chlorine are eliminated through accumulation in senescent leaves. The species is known to drastically restrict its water loss which considerably raises the temperature on the leaf surface.

The species is capable of withstanding frequent inundations by seawater. In highly saline areas it is bushier in habit with thick fleshy leaves. Seeds from *Salvadora persica* trees growing near the seashore are known to contain more oil than seeds from trees growing in non-saline areas. At the same time, it gives more fruit if dry hot winds blow more frequently in summer.

It thrives on a variety of soil including sandy loam, clayey loam, gravelly, shallow, calcareous and sand dunes; tolerates a degree of salinity or alkalinity with a pH of 6.5 to 8.5.

Propagation

It can be propagated through seeds, layering and mostly by root suckers. The growth rate is rather slow during the first two to three years of planting. Seedling trees get maturity after 7 to 9 years of planting. Whereas, trees raised from root suckers bear fruits early in about 5 to 6 years. The flowering period is long from November to March. The fruits are available from April to June.

For raising propagules seeds are soaked for 24 hours in fruit pulp solution. They gave maximum germination and shoot growth. Two seeds are sown per polybag at 1.0-2.0 cm depth during June under nursery conditions. Thus 15 g seeds are required for planting one hectare area.

Planting in the Field

The first ploughing of land is done in the first week of June and left fallow for 20-25 days for solar exposure for drying weeds, aeration and facilitating decaying crop residues. Thereafter, a second ploughing is done and the field is leveled through the planking. The crop is given NPK at 30:20:15 kg/ha. Half of N and the entire quantity of P and K are applied basally and the rest is given after 120 days. A spacing of 5X5 meters is optimum for good growth under field conditions.

Harvesting and post-harvest management

Fruits require 4-5 months for maturity, i.e., from December to April-May. The plant may be uprooted after 2 years of growth at any time of the year for root production. Yield of about 200 kg roots after two years per hectare.

Uprooted whole plants are separated into leaves, stems and roots with the help of stainless knives/scalpels. Stem branches and roots are used freshly. It can be stored in well-ventilated shady places.

Increased revenue from Cashew Focusing on Cashew apple utilization

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Introduction

Cashewnut *(Anacardium occidentale L.)* is one of the most important agro-industrial crops in India, Brazil,Vietnam, and African countries. It is primarily cultivated for its nut, and widely grown in tropical areas. However, due to the high value of the nut, another important produce from cashew i.e., cashew apple, has been neglected all along without any utilization. Cashew apple has several medicinal properties and is highly nutritious.The production of cashew apple in India alone is estimated to be around 60 lakh tonne per annum. The cashew apple is not commercially utilized in India, except in Goa where it is profitably used for the production of feni.The cashew apple, weighing about8-10 times that of the nut, is an equally valuable produce from the crop, if it is economically exploited. By effective utilization of cashew apple on commercial scale, the farmers can be assured of increased income which will encourage them to take up cashew cultivation with renewed interest.

Cashew Apple botany *(Anacardium occidentaleL.)*

Cashew is found in two parts; the nut and the peduncle. The nut is of greater economic interest. The peduncle region i.e., cashew apple, also a pseudo-fruit, is juicy fibrous fruit. Cashew apples are derived from a tissue called thalamus or receptacle or stalk present outside the ovary.The distinct layers like exocarp, mesocarp and endocarp are absent in cashew apple. Thus, it is called as pseudocarp or false fruit.The development and maturity of cashew apple is in consistence with nut maturation.The matured cashew apples are spherical or cylindrical in shape without or with medial depression and look like a pyriform shaped hypocarp. During maturation and ripening, the firm, fragile and green, immature cashew apples are turned to soft and juicy with the

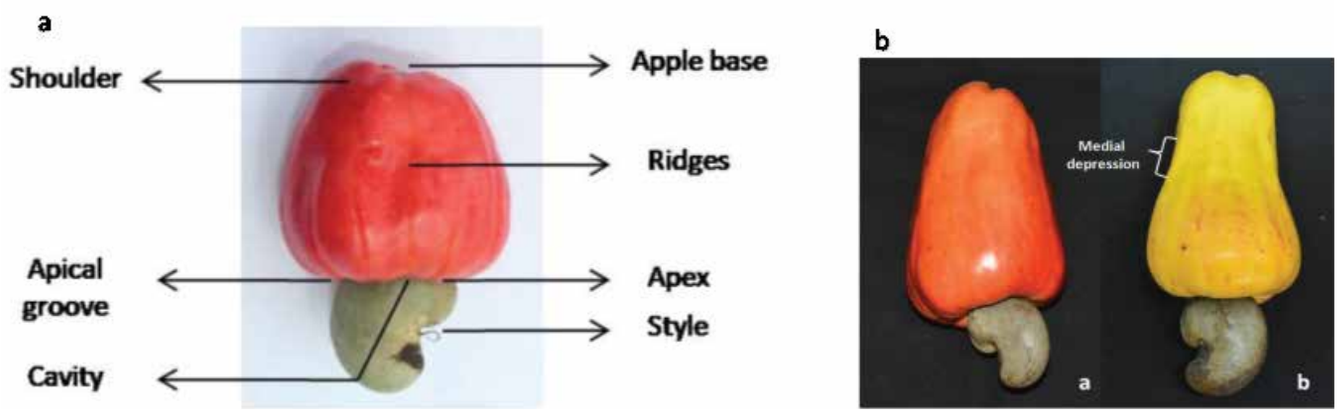

Fig. 1:Botany of cashew apple (a) and cashew apple without and with medial expression (b) (Source: Preethi P et al, 2019). Biochemical properties of cashew apple

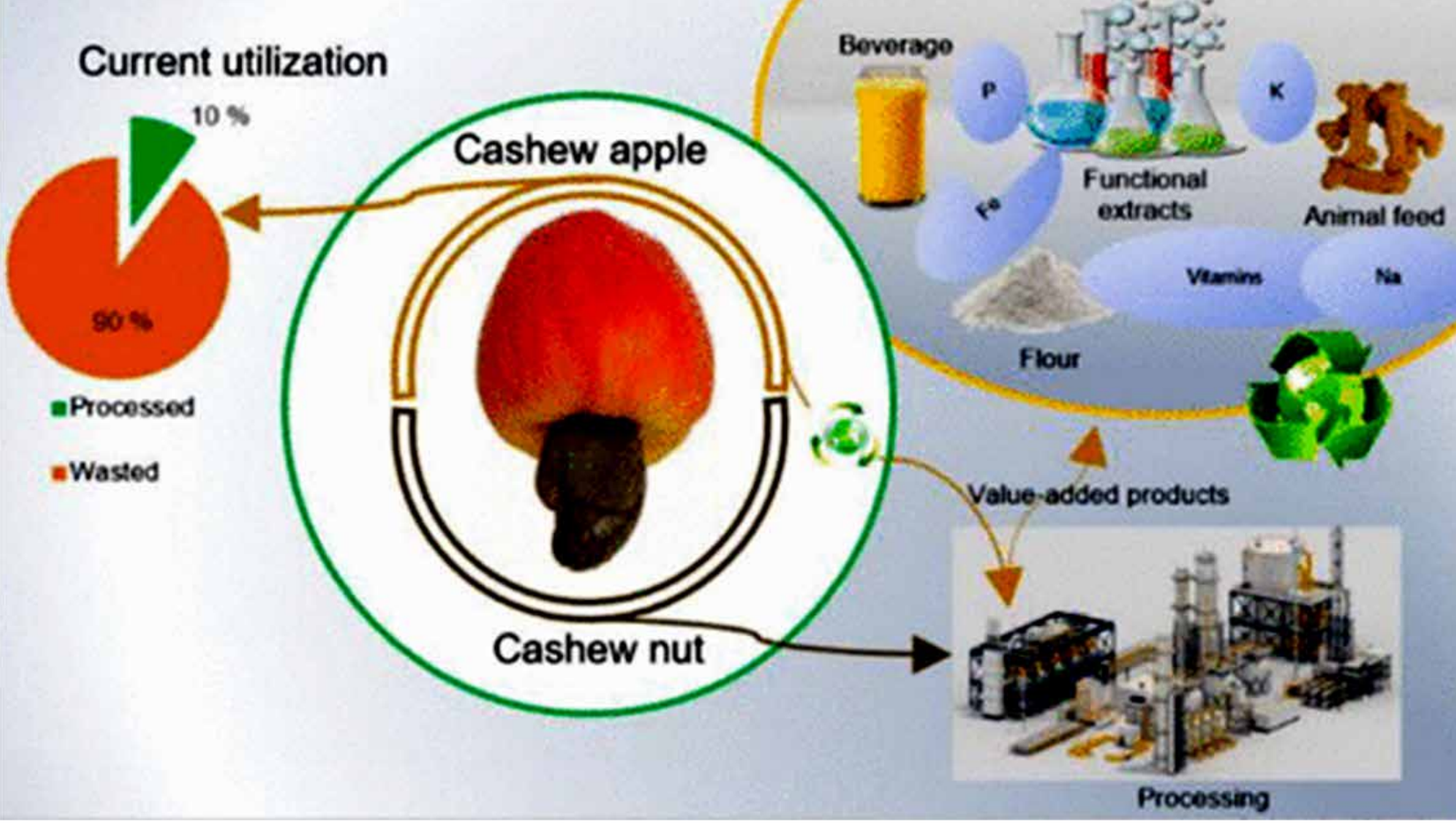

Fig.2: over view of multiple uses of cashew apple (Source: Raphael Aidoo et al, 2022)

Constituent	Cashew apple yellow	Cashew apple red	Pineapple	Avocado	Banana	Lime	Mandarin	Orange
Riboflavin	99	124	20	150	60	Traces	30	30
Vitamin C	240	186	24	16	10	45	31	49
Calcium	41	41	16	10	8	14	33	33
Phosphorus	11	11	11	38	29	10	23	23
Iron	3	3	0.3	0.3	0.6	0.1	0.4	0.1

different outer spectrum (red, orange and yellow)depending on the varieties (Fig.1).

Cashew apple is rich in ascorbic acid (240mg/100g) which is almost six times that of citrus fruits (40mg/100 g) (Nagaraja, 2007). It is also a good source of fibre and contains free soluble sugars which are mostly reducing sugars. On a dry weight basis, the crude fibre content varies from 15 to 18%. Vitamin B2 content of cashew apple is about 5-fold when compared to pineapple and grapes. The vitamin C content of cashew apple is 5 to 10-fold more than of pineapple, banana, orange and grapes (Nagaraja, 2007).

Utilization of cashew apple

Large number of technologies that are economical and effective, have been developed for the production of various value-added products from cashew apple (Fig.2)

a. Fresh apple beverages

Clarified and cloudy juice, juice concentrate, syrup, squash and ready- to- serve drink are some of the nutritious and refreshing beverages that can be made from the unfermented juice of cashew apple by adding varying concentrations of sugar, citric acid and preservative.

ICAR-Directorate of Cashew Research, Puttur has developed a ready to serve (RTS) from cashew apple called as 'CashLime.' Cash Lime is a cashew apple and lemon juice blend RTS preparedusing cashew apple pulp.The nutrient rich drink can be stored under refrigerated conditions for

Fig.3:Cashew apple products developed at ICAR-DCR, Puttur (Source: Preethi P et al, 2019).

maximum of five months with maximum retention of nutrients and biochemical quality parameters (TSS- 10.5°Brix, vitamin C - 72 mg/100 ml, Tannins- 76 mg/100 ml, Total Phenols - 58 mg/100 ml).

b. Fermented beverages

Cashew apple can be utilized for the manufacture of fermented products like wine, vinegar, liquor and alcohol. Cashew apple vinegar can be prepared by alcoholic and subsequent acetic fermentation of juice, which is perhaps the oldest known fermentation product (Sobhana, 2019). Cashew liquor is not made by blending of spirits as done in case of foreign liquor, it is prepared from pure cashew apple juice only. One litre of 60-62% ethyl alcohol can be obtained from eight litres of cashew apple juice.

Cashew apples are utilized widely in Goa for the preparation of liquor, 'feni' by distillation. Cashew apple juice is extracted and kept for fermentation for a few days. Fermented juice is then double distilled and the resulting beverage is called feni or fenny. Feni has about 40-42% alcohol. The single-distilled version is called urrac, which has about 15% alcohol (Sobhana, 2019). Feni is primarily considered as country liquor and it has a strong fruity flavour, peculiar taste, strong aroma and astringent smell. Feni liquor has been registered as the first geographical indication (GI) product from cashew (Elsy et al, 2009). Cashew wine is a product of fermentation of hexose sugar of cashew apple juice by intact yeast cells to form ethyl alcohol and carbon dioxide. Kerala Agricultural University has developed methods for producing four grades of wine such as soft, medium, hard and sweet, based on the alcohol percentage and sweetness.

c. Products from Cashew Apple Pulp

Jam is the most important pulp product of cashew. It can be prepared by boiling the cashew fruit pulp with sufficient quantity of sugar and a pinch of citric acid to a reasonably thick consistency firm enough to hold tissues in position. Mini et al (2007) reported that cashew apple can be mixed with pineapple, mango or combination of mango, pineapple and apple in 50:50 ratio for preparation of jam. The Madakkathara Centre is commercially producing Cashew apple- Mango mixed jam named Cashewman (Sobhana, 2019).

d. Osmo-dehydrated products

Candied fruit is prepared from cashew apple by impregnating with cane sugar with subsequent draining and drying. One kilogram of cashew apple on processing gives 745 g candies.The syrup left over from the candying process can be used for sweetening chutneys, in vinegar making or for candying another batch of fruits. Cashew apple can also be utilized for the preparation of tutty fruity. One kilogram of cashew apple on processing gives 715 g tutty fruity (Sobhana, 2019).

Osmotically dehydrated cashew apple is a novel value-

added product developed from the cashew apple. Sugar has been completely replaced with honey in preparation of this product, hence having medicinal property with no side effect of sugar. Thus, it is possible to make the seasonal fruit available to the consumers throughout the year. One Kg of good quality fresh cashew apple on processing gives about 200g of osmotically dehydrated cashew apples(Sobhana, 2019).

e. Culinary uses

Sliced raw green fruit can be used to prepare pickle using chili powder, gingelly oil, fenugreek powder, asafoetida, turmeric powder, garlic, mustard powder, a pinch of sodium benzoate and salt to taste. Chutney can be prepared from sliced cashew apple using sugar, onion, ginger, cumin, pepper, cardamom, cinnamon, coriander powder, salt, vinegar etc. (Sobhana, 2019).

Potential uses of Cashew apple

Considerable amount of cashew apple residue is obtained as waste after utilization of cashew apples for the manufacture of soft drinks or fermented beverages. Nutrient content of cashew apple residue includes total ash (1.6%), total tannin (5.2%), calcium (20.6mg/100g), phosphorus (152.7 mg/100g), crude fibre (8.4%), protein (8.8%) etc. The cashew apple residue has several agricultural, industrial, medicinal and nutraceutical uses.

Agricultural uses

a. Vermicompost

The cashew apple waste which is highly perishable and seasonal, can be converted to vermicompost with good manurial value of 1.69% N, 0.44% P and 0.58% K using Eudrilus euginae. The pH of the compost from cashew apple is 8.9 and hence it can be used as a good ameliorant for acidic soils.

b. Animal feeds

The cashew apple residue can be utilized for the preparation of cattle feed, pig feed and poultry feed. Cashew peel (7.6% protein, 12.3% fat and 59.2% carbohydrate) is a good poultry feed. Cashew apple residue after fermentation can be blended up to 20% to prepare animal or poultry feed without any adverse effect on milk yield (Nagaraja et al, 2007).

Industrial uses

a. Bio fuel

The potentials to utilize

cashew apple for production of alcohol to be used as a bio fuel are immense. Fresh cashew apple contains 9.5 to 10% carbohydrate in addition to varying quantities of fat, mineral and vitamins. It is estimated that cashew apple can yield 8 to 10% of ethanol. Every kilogram of raw nut generates apple equivalent to produce 500 to 600 ml of ethanol of about 70% purity. There is a huge potential for generating ethanol from cashew apple.

b. Bio gas

Ripened cashew apples can be used as raw material for biogas plant.

Medicinal uses

Cashew apple is used as a curative against scurvy and stomach ailments like dysentery and diarrhoea. Cashew apple juice without removal of tannin is prescribed as a remedy for sore throat and chronic dysentery. Fresh or distilled, it is a potent diuretic, possessing anti scorbutic properties and is useful for kidney problems and in advanced cases of cholera.

Use in nutraceuticals

Ascorbic acid, fibre, carotenoid pigments, minerals and other chemicals which are of significance to human health are present in cashew apple. A valuable by product that can be obtained from cashew apple waste is pectin (1.6 to 2.03%). Pectin is used in manufacturing jams, jellies, marmalades, preserves etc. It is useful in thickening, texturizing and emulsifying agent and finds numerous applications in pharmaceutical preparations and cosmetics.The cashew apple pomace or fruit waste has been identified as the ideal medium for pectinase enzyme production for Aspergillus foetidus through solid state fermentation.

Economics and marketing of Cashew apple products

Economics of processing of cashew apple for syrup production has been worked out (Mini et al, 2006).By processing one tonne of cashew apple, a net profit of Rs. 10,368/- can be obtained. Considering that the average yield of nut in India is 800 kg/ha, a production of 6.4 t/ha of cashew apple can be anticipated. A production of about 2t/ha of cashew apple can be ensured, taking 30% of the total production as good for processing. Thus, the additional income from a hectare of cashew orchard from the processing of cashew apple worked out to be Rs. 20,736/-, if a farmer or farmers group can venture into this endeavour.The income can be further enhanced by processing cashew apple for high value products like alcohol and wine. Compared to other fruits, the advantage of cashew apple is that it is available free of cost and hence, the price of cashew apple can be fixed by about 20% less than that of conventional fruit drinks like mango and pineapple.

Way forward

Economic utilization of cashew apple has not progressed to the desired level in spite of excellent qualities of cashew apple and the availability of technologies for its processing to various value-added products. Processing of cashew apple is to be considered as a programme of agricultural waste utilization, adding income to the growers. Commercial exploitation of cashew apple is the need of the hour considering itsvast potential in enhancing the income from cashew plantations. However, the financial and policy support of the state and central governments are vital in promoting the economic utilization of cashew apple. Additional income from cashew apple processing will make cashew cultivation more attractive to farmers, there by enabling the country to achieve self sufficiency in raw nut production.

Reference

A Sobhana. 2019. Cashew Apple Utilization-Generating Wealth from Waste. Advances in Nutrition & Food Science. 4(4): 1-5

Elsy, C.R., Jose Mathew and Arun S. 2009. Protection of geographical indication of cashew products for enhancing market potential. Proc. 7th National seminar on Cashew development in India-enhancement of production and productivity, Bhubaneshwar, 2-3, pp. 79-81

Mini C, Mathew J. 2007. Multi uses of cashew apple. Proceedings of 6th National Seminar on Indian Cashew in the next decade- challenges and opportunities, Raipur pp: 45-52.

Mini, C., Jose Mathew and Jesy Thomas, K. 2006. Economic potential of cashew apple. Cashew Bulletin XLIV (6): 5-8

INSECT PESTS IN FESTING CHILLI ECO SYSTEMS

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Chillithrips

1.Chillithrips, Scirtothrips dorsalis (Thripidae, Thysanoptera)

Spread:

It is a polyphagous pest and widely distributed in chilli growing areas of India.

Host range:

It feeds on a number of plants including chillies, tomato, brinjal, castor, ground nut, sunflower, cotton, mango, grapes, guava and citrus. The pest is more common in unirrigatedchillies.

Identification:

Adults are slender, yellowish brown in colour, having apically pointed fringed wings and they measure 1 mm in length. The nymphs resemble the adults in shape and colour but are wingless and smaller in size.

Biology:

The pest is active throughout the year except during the rainy season. The female thrips inserts about 45-50 eggs inside the tissues of the leaves and shoots leaves and shoots. The eggs hatch in 5 days and larva feeds for 7-8 days and pupates in 2-4 days. The adult thrips lives for about 30 days. There are several generations of the pest a year (Sree Rama et al., 2021).

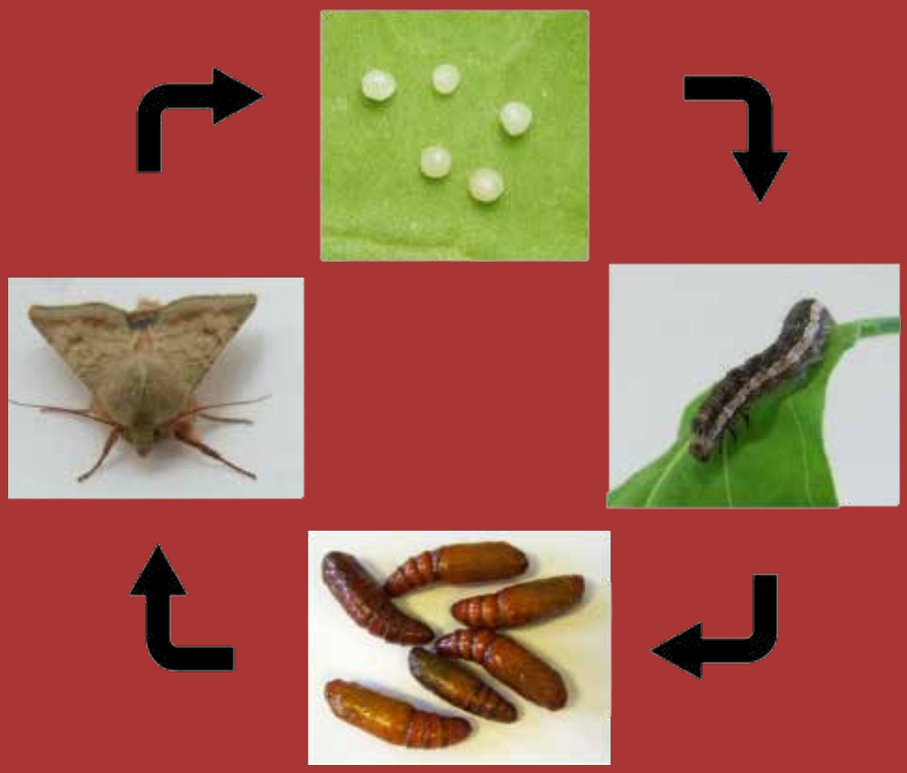
Nature of damage and Symptoms:

Damage is caused by the adults as well as the nymphs. They lacerate the leaf tissues and cause leaves to shrivel. Upward curling of leaves is the typical symptom (Sree Rama et al., 2021). In case of severe infestation, heavy curling of leaves is observed, buds and fruits become malformed. Buds become brittle and dropped (Berke and Sheih, 2000). The attacked plants remain stunted and finally dry up.

The insect is also responsible for transmitting the virus causing "leaf curl" disease of chillies.

Management practices:

1. Seed treatment with Imidacloprid @ 3 g/kg of seed.
2. Soil application of fipronil 0.3% G should be applied @ 8 kg/acre when the soil is moist.
3. Spray application of Carbaryl 50 WDP @ 600 g/ phosalone 35 EC @ 400 ml/ acephate 75 SP @ 300g/ fipronil @ 300 ml/ spinosad 75 ml/ difenthuron 300g/ acre. If mite damage is there, Carbaryl and acephate are not



Fruit borers

to be used.
4.Thrips, Franklinothripsvespiformis and Erythrothripsasiaticus are predaceous on the insect.

2. Fruit borers, Spodopteralitura, Helicoverpa armigera, Utethesia pulchella (Noctuidae, Lepidoptera)

Initially they feed on the leaves, later bore into chilli pods.
Symptoms:
1. Affected fruit turn whitish and then dry up.
2. Irregular hole is seen in the fruit due to the feeding of S. litura.
3. Round neat hole is seen on the fruit due to the feeding of H. armigera.
4. Faded pericarp in typical fashion with seeds intact due to the infestation of U. pulchella.

Management practices:
1. Remove the affected plants.
2. Spray application of Malathion 50 EC/ Chlorpyriphos 20 EC @ 2 ml/ lit. or thiodicarb 200g/ ac.
3. For Spodoptera, spray application of poison baits 5 kg of rice bran + 500 g Carbaryl/ 500 ml Chlorpyriphos + 500 g jaggery + sufficient amount of water is made into small balls and is applied in the evening.

3. Chilli mites, Polytarsonemus latus (Tarsanomidae, Acari)

Infestation starts in the nursery after 40 days of germination. 2-3 month crop is largely affected. Mites are seen in large numbers in the under surface of the leaves. They suck the sap of the plant and devitalize the plant (Luypaert et al., 2015).
P. latus: is a vector of leaf curl (Murda disease).
Symptoms of attack are as follows:
1. Leaves roll down along the margins.
2. Petioles of older leaves elongates
3. Younger leaves at the tip of

Chilli mites

the bunch cluster.
4. Affected leaves turn dark green.

Management:

1. Avoid use of excess nitrogen.
2. Spray application of Dichofol (Kelthane) @ 5 ml/lit, wettablesulphur @ 3 g/lit, micronized sulphur @ 2.5 g/lit.

INVASIVEPESTTHRIPS (Black thrips): Thrips parvispinus (Thripidae: Thysanoptera)

This invasive pest was firstly reported on papaya from Bangalore (Tyagiet al.,2015) and Dahlia rosea(Rachanaet al., 2018). Besides,that it is currently threatening chilli cultivation also inIndia. Thripsparvispinus(Karny) is native of the South East Asian pest species, a significant pest species ofquarantine relevance that has been reported from Thailand to Australia and is a problematic pest on a number of agricultural and horticulture crops (Moundand Collins 2000). They significantly reduce productivity by causing widespread flower loss, fruitdeformity and fruit drop in chillies. The emergence of T. parvispinusin several places across our country has drawn attention because it is a serious pest that causes substantial crop losses.


Thripsparvispinus

Symptoms:

- Loss of vigour and vitality of plant.
- Failure in bud, flower and fruit development.
- Failure in the development of flowers to fruits.
- Wilting stunted.

Management:

- Proper Sanitation practices.
- Reflective plastic Mulching, Installation of blue sticky traps and need based application of Insecticides viz., Fipronil80 WG @ 0.2g/L - Spinetoram 11.7SC @ 1ml/L (sequential sprays at 10 days interval).

Spraying of

- Acetam prid – 40-50 g/ac,
- Fipronil 80 wg – 40 g/ac,
- Cyantraniliprole – 240 ml/ac,
- 40 % Imidachloprid + Fipronil 40 % WG – 40 g/ac.
- Research work is being undertaken for the management of this pest.

References:

Luypaert, G., Witters, J., Berkvens, N., Huylenbroeck, J.V., Riek, J. D., Clercq, P.D. (2015). Cold hardiness of the broad mite, Polyphagotarsonemuslatus (Acari: Tarsonemidae). Experimental and Applied Acarology.DOI 10.1007/s10493- 015-9894-3.

Berke, T. and Shieh, S.C. 2000.Chilli peppers in Asia. Capsicum and Eggplant. News Letter, 19: 38-41

Mound, L. A. and Collins, D.W. (2000). A South East Asianpest species newly recorded from Europe: Thripsparvispinus(Thysanoptera: Thripidae), its confused identity and potential quarantine significance. Journalof European Entomology, 97: 197–200.

Rachana, R. R., Roselin, P. and Varatharajan, R. (2018).Report of invasive thrips species, Thripsparvispinus(Karny) (Thripidae: Thysanoptera) on Dahlia rosea(Asteraceae) in Karnataka. PestManagement in Horticultural Ecosystems, 24(2): 187–188.

BLOOMS IN BLOOM !

A Recap Of Pooppoli Flower Festival 2024

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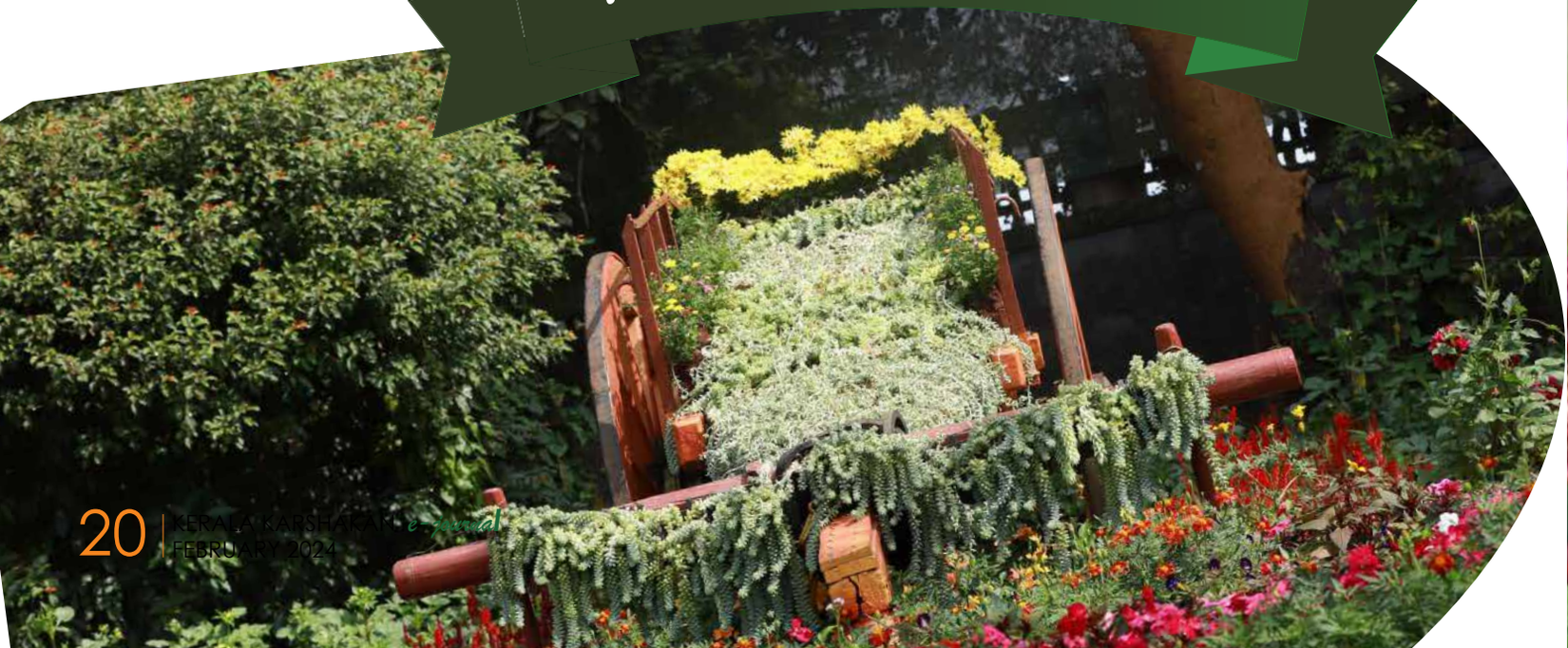
The eightth edition of much-anticipated Poopoli Flower Festival unfolded its petals at the enchanting venue of Pooppoli Garden, Regional Agriculture Research Station, Ambalavayal, Wayanad,. The international flower festival happened from January 1st to 15th, 2024. This edition of pooppoli flower festival was, inaugurated through online mode by Hon.Agriculture minister of Kerala Sri P . Prasad. Just like its former editions ,this year also



the fest immersed attendees in a captivating celebration of floral wonders and diverse attractions.

The festival's highlights were a symphony of natural beauty and human creativity. Attendees marvelled by the spectacular sculptures made throughout the garden catching the attention of visitors . One of the major attractions were the vibrant peacock display near

the boat house, adding allure to the picturesque surroundings. The scenic Rock Garden, nestled close to D Pond, provided a tranquil setting to appreciate nature's beauty. The innovative Vertical Garden showcased a creative display of flowers in a unique vertical arrangement.

Basking in the golden glow of the Sunflower Garden, situated near KVK, became a radiant spectacle that captivated visitors. The vibrant hues of Asters in a dedicated garden near the boat house offered a colorful feast for the eyes. Diverse varieties of Dahlias at two locations, near D Pond and strategically placed near the exit, created a memorable farewell. An Artificial Forest near the boat house brought a touch of wilderness to the festival.

The festival also featured

heartwarming additions, such as the Pet Show, celebrating the bond between pets and their owners. Attendees lost themselves in the fragrance and elegance of the Rose Garden, a romantic setting near D Pond. Various stalls offered an assortment of floral delights, handicrafts, and souvenirs. Valuable insights into sustainable agriculture were gained at the Aquaponics exhibit on the festival grounds.

Informative sessions took place at the Seminar held in the KVK Training Hall,

providing valuable knowledge about floriculture. The medicinal properties of flowers were explored at the Medical Exhibition located conveniently near the Police Aid Post. The Amusement Park on the festival grounds brought joy to the whole family, promising fun and laughter for all. A diverse culinary experience awaited at the Food Court, conveniently located near the festival grounds.

Participants engaged in National Service Scheme (NSS) activities, contributing to community service and making a positive impact. Captivating stage performances showcasing the rich cultural tapestry through dance, music, and more entertained attendees. The elegance of Gladiolus flowers in a dedicated garden celebrated the beauty and grace of these stunning blooms.

The festival went beyond floral attractions, featuring medical exhibitions by Dr. Moopand Medical College, sculptures, specially designed models, a pet show, and cultural events every night. An aquarium tunnel provided a delightful experience of walking under the ocean. The student union of the college organized a food court, and the fest adhered to the green protocol. In addition to amusement rides and shopping stalls, this international flower festival created a harmonious blend of entertainment, education, and celebration. The success of the Poopoli Flower Festival once again highlighted the importance of floral beauty in enriching lives and fostering a sense of community.

Aeroponics

a novel approach for potato seed mini-tuber production in non-conventional areas

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Aeroponics is a soil less culture comprising of root system enclosed in a dark chamber and nutrients are supplied to the roots through misting. It is a subgroup of hydroponics. The word aeroponic is derived from the Latin meaning of *"aero"* (air) and *"ponic"* (work).This technique allows the roots to absorb much needed oxygen and nutrients, thereby increase the rate of root metabolism and growth reportedly upto 10 times of that in soil.

Though it is a temperate crop, it can be adopted to a wide range of climatic conditions. In India, potato crop is raised in different areas and seasons, where day and night temperatures are below

Comparisons between aeroponics and hydroponics

Aeroponics	Hydroponics
Roots are hanging in chamber and feed the roots with fine misting of nutrient solution	Roots are always immersed in water containing nutrient solution
More root aeration and root metabolic activity	Less or no root aeration and less metabolic activity because continuous immersion of roots
Higher nutrient uptake	Less nutrient uptake
Higher water and fertilizer use efficiency	Less water and fertilizer use efficiency
Suitable for all high cost low volume crops including tuber crops	Suitable for all high cost low volume crops but not suitable for tuber crops
Comparatively more yield and high quality of produce	Comparatively less yield and less quality of produce
Spread of disease is slower	Spread of disease is faster

Aeroponic chamber setup

25^{0}C and 20^{0}C, respectively. While, for tuberization a lower temperature of 18^{0}C to 20^{0}C is ideal.

Potato is a vegetatively propagated crop and hence production of disease free seed tubers for propagation on commercial scale is important. The quality seed tuber production with free of virus and other pathogens are not possible all over India even though environmental conditions are favorable. The production of seed tubers in hills and sub-tropical plains of India during low aphid population period and its transportation to all over India, for commercial fresh tuber production is the present scenario. This leads to hightransportation and handling cost, subsequently farmer would incur more cost (30% of total production cost) for seed tubers. The multiplication rate of potato in conventional cultivation is

Components of aeroponics:

Materials	Role	Specification
Water filter	Filtered/de-ionised water should be used for preparation of nutrient solution	Depending on capacity of aeroponic unit water filter capacity (filter water per hour) should be selected
Chamber	To locate/grow plants	Different kinds of materials were used according to growers preference and availability
Electric board	To mount electric materials	Metallic or wooden materials
High density polystyrene sheet	To mount plants/seedlings	High density sheets should be used to bear weight of plant canopy.
Nutrient tank	For preparation of different nutrient stocks	Non-metallic and it should not react with nutrients used for nutrient solution
Nutrient solution collection tank	Once sprayed nutrients will be collected in this tank	Non-metallic and it should not react with nutrients used for nutrient solution
Pump	Pump the nutrient solution to nutrient circulation pipe from collection tank	Depending up on required pressure pump capacity should be selected
Filter	To filter nutrient solution for spray in chamber	Filter should be mounted before pump and after nutrient solution collection tank
Timer-1	To regulate the pump to on and off time for misting	AC timer
Timer-2	To operate different time period of on and off time for day and night	AC timer and it should have series of function (minimum two) to regulate timers for day and night
Electric wire	For electric connections	Good quality insulated wires should for used
Misters/foggers/ nozzles	For misting of nutrient solution in aeroponic chamber	Mister should produce fine mist of water droplets
Misters/foggers/ nozzles	For misting of nutrient solution in aeroponic chamber	Mister should produce fine mist of water droplets
CPVC pipes	For misting of nutrient solution in aeroponic chamber	Depending on required diameter
CPVC pipes	For misting of nutrient solution in aeroponic chamber	
Pipe stand	To mount nutrient circulation pipe system from above the base of chamber at desirable height	Metallic; but it should not react with nutrients used for nutrient solution
Glue	While pipe connection glue should be used to avoid leakage of solution and to detach pipes because of pressure	Good quality glue should be used

Inside view of aeroponic chamber

low (i.e., 5-7 tubers per plant); for these reasons a large area should be devoted for potato seed tuber multiplication.

From the above, it is clear that rapid multiplication of early generation, virus free and low cost quality potato seed tubers are necessary to meet the farmers demand of certified seed tubers. In this regard, adoption of aeroponic technique for mini-tuber production by using early generation planting material in controlled condition is one of the potential methods.

The main advantages of aeroponics is that, it drastically reduces the quantity of water, fertilizer usage (reduce water usage by 80% and fertilizers usage by 60%) and still maintains higher metabolic activities of growth and increased yield. Aeroponics reduces the cost of maintenance requirements such as fertilizer, chemicals, disease and insect control, fumigation, staff and more. Plants grown in the aeroponics systems uptake more minerals, making the plants healthier (Naik et al., 2022a)

In aeroponic production of potato mini-tubers, various factors are involved in maximizing growth and mini-tuber yield. The knowledge on aeroponic technique, nutrient management, environmental control, etc. are very crucial.

Design of aeroponic chamber

Construction of aeroponic chambers:

Aeroponic chamber

Timer & control panel

Rubber cork used for fixing of plants

should have a minimum dimension of 1 m height, 1.5 m width and convenient length. Chamber body should be made from thermal insulated material to avoid the loss of regulated root zone temperature to ambient and to avoid the entry of light in to root zone area. The chamber have opening from the top for planting of seedlings. This opening was covered by high density polystyrene sheet with equidistante holes for planting of potato seedlings. Above the polystyrene sheet, one layer of flex sheet should be spread to avoid the entry of light in to root zone to avoid conversion of stolon to vegetative shoot.

Nutrient solution circulation and misting system:

Nutrient solution once misted in chamber was recollected just below the chamber and reused for misting in chamber through misters with the help of pump.

The seedlings are planted in planting area with the help of rubber cork these plants roots were sprayed with fine mist of nutrient solution at regular intervals through misters mounted below the root zone on two or three rows of CPVC pipe at the rate of one misters for every 30 cm on each pipe, facing upward. The nutrients solution misting was regulated through timer, which was connected to pump. The timer allows the electricity to pump and regulate the on and

Nutrient circulation system

Planting area of aeroponic chamber

off time of misting.

Electricity supply:

For successful aeroponic cultivation of any crop requires continues uninterrupted electricity. In aeroponics nutrient solutions sprayed in a regular interval. 30 minute absence of electricity leads to complete collapse of plants.

Transplanting of seedlings in aeroponic chamber:

Uniform size healthy potato seedlings (generally from tissue culture originated) should transplant in aeroponic chamber after hardening, at a spacing of 15 cm to 20cm. The transplanting should be carried out during evening hours.

Nutrient solution for potato mini-tuber production:

For potato mini-tuber production in aeroponics, nutrient solution concentration is the most critical factor to produce high yield and high quality mini tubers. Each crop has an optimum nutritional requirement and even each potato cultivar may require a specific nutrient solution.

Electric conductivity (EC):

Electric conductivity of a solution is the total amount of all the salts dissolved in it. Maintenance of optimum electric conductivity of nutrient solution is most critical in aeroponics. Amount of salts dissolved in nutrient solution is directly proportional to electric conductivity. Optimum electric conductivity for successful

Root growth

cultivation of crops in aeroponics lies between 1to 2.2mS/cm depending up on crops. Electric conductivity more than 2.3 adversely affect on physiological function of plants. It is necessary to measure electric conductivity of nutrient solution during final preparation. The amount of fertilizer and source of fertilizer greatly imparts the electric conductivity of nutrient solution. It is advisable to change nutrient solution in a regular time interval of 7 to 10 days.

pH:

pH is the degree to measure the acidic or alkalinity of particular nutrient solution. pH decides the amount of uptake of various nutrient elements required for growth and development of plant.Every crop requires specific range of pH of nutrient solution for proper growth and development. Each individual nutrient element possesses maximum uptake by plants at a definite pH range. In general pH range of 6 to 7 is ideal for aeroponic cultivation depending on crop species.

pH should be measured during final preparation of nutrient solution. pH changes as and when duration of nutrient solution increases. Periodic change of nutrient solution at a frequent interval is necessary. To increase the pH from acidic to neutral base chemicals like KOH or NaOH should be added. To decrease the pH acids like HCl should be added. Acid or base should be added at a very low concentration, generally at 0.1 N concentration. In some cases these chemicals which is added to maintain pH it self is a nutrient.

Replacement of nutrient solution:

Electric conductivity increases and pH alters while same nutrient solution remains supplied for long duration. Similarly, nutrient strength in solution gets depleted by plant up take. Hence nutrient replacement is most important to assured supply of nutrients. In early stage of crop duration, rate of nutrient absorption was low, hence we can maintain nutrient solution maximum up to 2 to 3 weeks depending on crop. In mid and later stages of crop growth rapid growth and development takes place, so it is advisable to change nutrient solution in 7 to 10 days interval depending on crop.

ON and OFF time/ misting cycle:

ON time or spray time and off time of misting of nutrient solution depends according to crops, variety, season and area of cultivation. During ON/spray time timer allow the electricity to pump and pump gets on; it feeds nutrient solution to nutrient circulation system allows misting in aeroponic chamber. Once set ON time over, timer stops the

Nutrient element	Nutrient element concentration (mg/L)
Nitrogen	321
Phosphorous	23
Potassium	614
Calcium	159
Magnesium	72
Sulfur	96
Iron	3
Copper	0.09
Manganous	0.75
Boron	0.36
Molybdenum	0.08
Chlorine	53
Cobalt	0.02

Nutrient salt/fertilizers	Source
Potassium nitrate	N & K
Calcium nitrate	N & Ca
Iron EDDH, Iron EDTA	Fe
Magnesium sulfate	Mg & S
Potassium phosphate	K & P
Boric acid, Boron EDTA	B
Manganese chloride	Mn & Cl
Zinc sulfate	Zn & S
Copper sulfate	Cu & S
Sodium molybdate	Na & Mo
Sodium Chloride	Na & Cl
Cobalt chloride	Co & Cl
Mono Potassium Phosphate	P & K
Zinc EDTA	Zn
Cu EDTA	Mn
Mn EDTA	Cu

Nutrient element concentration for potato mini-tuber production (Naik et al., 2022b)

supply of electricity to pump. Pump remains in off condition up to set off time in timer.

For potato mini tuber production in aeroponics Naik 2022c and Tengliet al. 2022 practiced 30 seconds spray time and 10 minutes off time during day hours, 30 seconds spray time and 20 minutes off time during night.

Maintenance of root zone temperature:

High ambient temperature of tropical and sub-tropical condition limits the production of potato which requires relatively cool weather. It can be overcome by cooling nutrient solution, helps to maintain optimum temperature inside aeroponic chamber. To achieve root zone cooling nutrient solutions were cooled in commercial scale water coolers for 18-20°C and used for spraying. It maintains root zone temperature up to 22-24°C in aeroponic chambers (Tengliet al. 2022).

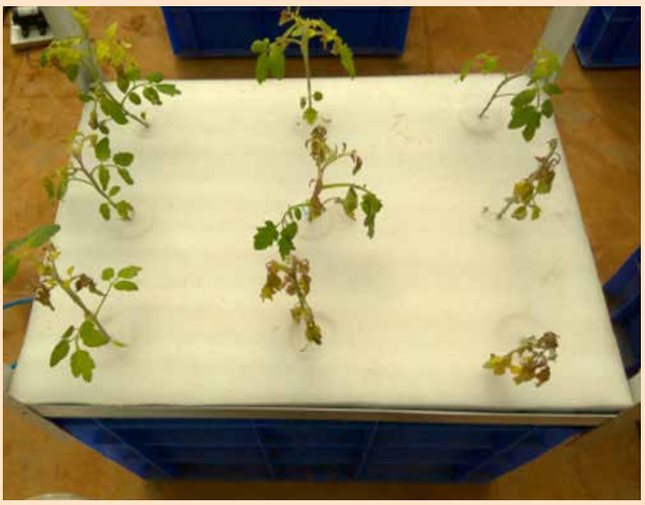
Plant density in aeroponic chamber:

To achieve maximum mini-tuber production through aeroponics optimum plant density is most important. 60 and 100 plants/m2is ideal for maximum production of potato mini-tubers.

Harvesting intervals, yield and storage of mini tuber:

Early varieties start stolanization at 45 to 50 days, mid-season varieties at 50-55days and late varieties at 55-65 days after transplanting in aeroponic chamber. Harvesting of seed tubers starts after 10 to 15 days after initiation of stolanization. Regular harvesting interval in aeroponics helps to a great size control of mini-tubers. A harvesting interval of 3 to 7 days is ideal. Mini-tubers of 3 to 6g weight is ideal to harvest. In each harvest it ensure that all ideal mini-tuber will harvest otherwise leftover mini-tubres become bigger in size during next harvest. Harvesting carried out during morning or in evening hours to avoid exposure of plant roots to higher temperature and light. Exposure of roots to light leads to converting stolons to vegetative part. Don't stop misting during harvesting to avoid water stress on plant and they shows temporary wilt in without mist.

Mini-tuber grown in aeroponics showed an increased number of opened lenticels due to high humid condition. Harvested mini-tubers spread in dark and clean room for curing for about 4 to 6 days. Care must be taken that mini-tubers should not be exposed to light. If



pH 3.8

pH 4.8

pH 5.8

pH 6.8

tubers are exposed to light, tuber greening is the problem because of increas in solasodine content. Cured tubers are store in cold storage (4^{0}C) for next use. On an average 20-60 mini tuber will be obtained in each plant. This difference was mainly due to the factors such that variety used, temperature, humidity, growing condition, knowledge of the grower, technique involved etc.

Conclusion:

Production of potato mini-tubers in aeroponic technique helps to obtain disease free seed tubers in commercial growing areas itself (i.e. tropical/sub-tropical plains) where environmental conditions are favourable. It helps to reduce the dependency of seed tubers coming from hills and north Indian plains of India; it greatly reduces the transportation cost there by reduction in cost of cultivation.

References

Naik R, Narasegowda, N. C., Mohanraju B.,Srinivasappaa K. N. and Tengli S. (2022a), Effect of season, root zone cooling and shading on growth and seed-tuber yield of potato through aeroponic technique. *The Pharma Innovation*. 11 (6): 2022.

Naik R, Narasegowda, N. C., Tengli S. and Mohanraju B., (2022b), Effect of different levels of modified Hoagland nutrient solution on pre-tuberization growth of potato under aeroponic system. *Multilogics in Science*. 12 (43): 2022.

Naik R (2022c), Studies on nutrient formulations for mini-tuber production of potato through aeroponic technique. Department of Horticulture, University of Agricultural Sciences, Bangalore, India, Ph.D. thesis, 256p

Ivy Gourd

A nutrient dense crop excellent for nutritional security

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The ivy gourd *(Coccinia grandis L.)*, a valuable underutilized vegetable with the potential to be domesticated, is very nutrient-dense and underutilized. It has excellent therapeutic value. There is a tremendous possibility to increase both the production and consumption of this vegetable in order to offer the general public a diet that is nutritionally healthy. The ivy gourd has properties including analgesic, antipyretic, anti-inflammatory, antimicrobial, antiulcer, antidiabetic, antioxidant, hypoglycemic, hepatoprotective, antimalarial, antidyslipidemic, anticancer and mutagenic.

Introduction

A specific quantity of vegetables must be consumed daily for a person to have a

healthy diet. These foods are rich in vitamins and minerals and have a natural preventive impact. There is a huge opportunity to increase vegetable production and consumption in order to give the general population a diet that is nutritionally sound. The ivy gourd *(Coccinia grandis L.)* is also known by the names "kundru" and "tindori." It is a highly beneficial, essential, underutilized vegetable with domestication potential. It is a dioecious perennial cucurbit with two sexual forms. It contains significant amounts of the vitamins C, B1, and B2, all of which aid in better alignment of the bones. Additionally rich in minerals including potassium, calcium, and iron are the tendrils of the ivy gourd. Ivy gourd has a high nutritious value and comprises 94 percent water, 1.6 g of dietary fibre, 1-2 g of protein, 0.4 g of fat, 3.1 g of carbohydrates, 156 μg of beta-carotene, 14 mg of iron, 260 IU of vitamin A, 28 mg of vitamin C, and 18 calories.

Origin and Diversity

It is native to north-central East Africa, however it can also be found growing wild in Indo-Malaysia. It's spread to Australia, the Pacific, the Caribbean, and the southeastern United States. In Africa, there are approximately 30 species of Coccinia. In addition to Africa, the cultivated species C. grandis (L) thrives wild in India and Southeast Asia's tropical regions. The highest levels of ivy gourd diversity can be found in

Eastern Madhya Pradesh, West Bengal, the North Eastern hill region, Uttar Pradesh and Bihar.

Botany and Floral Biology

It is a dioecious herbaceous perennial vine that can grow up to 9 to 28 m long. It has smooth stems, a tuberous root structure, and side-growing tendrils (Axillary). The leaves alternate along the stems and range in shape from heart-shaped to pentagon-shaped. The upper side of the leaf has no hairs, but the underside is covered in them. The flowers are large, white, and star-shaped. The corolla is white and bell-shaped. Each flower contains three stamens. Flowers of Coccinia grandis have inferior ovaries. The fruit is a smooth, brilliant red, ovoid to ellipsoid berry that is 5-7.1 cm long. The 6-7 mm long, tan seeds have thickened edges.

Climate and Soil

Ivy gourd thrives in tropical and subtropical climates that are hot and humid but not scorching. It cannot be grown in the shade. During the winter, it goes dormant, and new growth begins in February or March. In contrast to most other cucurbits, it tolerates heavy rain rather well. The ideal temperature range for its growth, quality, and yield is between 20 and 32°C. This vine thrives in well-drained sandy loam and fertile soil. The ideal pH for soil is 6.5.

Propagation Method

Stem cuttings are the most prevalent form of vegetative propagation for ivy gourds. Plant cuttings with 4-6 leaves that are 20 cm long and 2 cm thick can be utilized for propagation. Two or three cuttings should be planted 6 cm deep in a basin with a diameter of 60 cm. It is recommended that each basin be separated by approximately 2 metres. Planting occurs on the northern and central Indian Plains in February or July. Planting takes place in southern India between May and June, or September and October.

Training and Pruning

This ivy gourd requires trellising. In backyard gardens, they can be trained to climb over fences and rooftops. A pandal system or trellis must be constructed to train the vines. The plant vines are additionally supported by two-meter bamboo rods.

Irrigation

As soon as plantation is complete, irrigate the plants. These plants need minimal irrigation once every week throughout the hot summer months.

Variety	Description
Arka Neelachal Kunkhi (IIHR, Banglore)	An early cultivar, the fruits are extra-long (8.39 cm), uniform, cylindrical, and striped, and weigh between 15-20g. It produces 800 fruits on average every season and has an output potential of 15-20 t/ha.
Arka Neelachal Sabuja (IIHR, Banglore)	Fruits are conical in shape and feature a fractured stripe that gives them a dark green color. It yields up to 25-30 t/ha and produces 70-80 harvests every season (10-11 months).
Thar Sundari (CIAH, Bikaner)	Clonal selection based on geographical variation. Gynoecious plants develop slowly, have a lot of female blooms, and bear fruit in a parthinocarpic manner. The first harvest takes 50 to 55 days. The projected yield is 25-35 t/ha. High temperature tolerance (38-42°C).
Sulabha (KAU, Vellanikkara)	Clonal selection from indigenous material. The initial picking of parthenocarpic fruits is possible 45 to 50 days after sowing. The average output per plant is 19-20 kg, with an 18 g average fruit weight.
Kashi Bharpoor (IIVR, Varanasi)	High-yielding (25-28 kg/plant) and produces round, pale-green fruits (3,200-3,500 per plant).
Indira Kundru-05 (IGKV, Raipur)	Clonal selection was used to generate this high-yielding type of plant. Average yield per plant is 22 kg. The fruits are elongated and green, and they have white stripes on them.
Indira Kundru-35 (IGKV, Raipur)	Clonal selection was used to generate this high-yielding type of plant. Average yield per plant is 21 kg.

Fertilizer Requirement

Due to the plant's robust growth pattern, ivy gourd responds positively to the application of fertilizers. The application of fertilizer depends on the type and nutritional content of the soil. Add approximately 25 tonnes of Farm Yard Manure (FYM) during field preparation and planting. Commonly, 40 kg of phosphorus, 40 kg of potassium, and 60 kg of nitrogen are applied per hectare. After pruning, a half-dose of nitrogen, a full-dose of phosphorus, and a full-dose of potash are administered. Four divided doses of the leftover nitrogen are applied monthly.

Weeding

Weeding and light hoeing should be done in ivy gourd farming during the early stages of plant vine growth.

Harvesting and Yield

It takes the ivy gourd plant two months to begin blooming. Yields start six months after planting and continue all year. Around a week after flowering, young fruits are collected. As long as there is sufficient moisture to grow new leaves and blossoms, harvesting should ideally be done every week. In the southern and central regions of India, fruiting begins 10–12 weeks after planting and lasts the entire year.

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Alleppey Finger Turmeric

The Golden Treasure of Kerala

Turmeric *(Curcuma longa L.)* is an important commercial spice crop grown in India. It is also known as the Indian saffron due to its inherent yellow colour. Because of its colouring, flavouring, and digestive qualities, it has been used as a spice since the Vedic and Biblical era. India leads the world in terms of turmeric production, consumption, and export. According to the data from spices board during 2021-22, worth of Rs.178,433.66 lakhs was exported from our country. The varieties which are having high curcumin content has high demand in export purposes.

CURCUMIN

The pigment curcumin is the main derivative of turmeric rhizome. It is a bright yellow bioactive hydrophobic polyphenolic pigment well-known for its robust and effective antioxidant, neuroprotective, anticancer, and cardioprotective effects. It has the property to lower the inflammatory response, effectively relieve symptoms, and have a role in the treatment of diseases viz., arthritis, psoriasis, depression, and atherosclerosis. Curcumin is chemically a diarylheptanoid Curcumin was first isolated from turmeric in 1815 and was identified as diferuloylmethane (curcumin) in 1910. The curcumin preparations currently

available contain approximately 77% diferuloylmethane (curcumin); 18% of them contain demethoxycurcumin, and 5% of them contain bisdemethoxycurcumin. Turmeric is composed of 3–5% curcuminoid. However, curcumin is responsible for the main biological activity of turmeric.

ALLEPPEY FINGER TURMERIC

In the World few varieties have richness, aroma and vibrant colour. Alleppey Finger Turmeric (AFT) stands out as a true treasure among the different varieties of turmeric available around the world. Alleppey Finger Turmeric is the original genuine high curcumin turmeric.This generic variety of turmeric is grown only in Kerala especially in central region of Kerala i.e., Ernakulam, Idukki and Kottayam.

Alleppey turmeric has a pleasantly flavourful bright orange colour, which not only provides a pleasing tone to food but also hints at its potent curcumin content. Alleppey Finger Turmeric more closely resembles the flavour of fresh turmeric and has a somewhat earthy aroma with surprisingly delicate top notes of lemon and mint, reminiscent of its cousin, ginger.As the name indicate the shape of turmeric look like a finger. This Indian ground turmeric contains high levels of curcumin. Its curcumin content on average at 5 percent and may be as high as 6.5 percent, making it a more effective colouring agent with superior fresh turmeric flavour notes. Due to its high curcumin content, it has gained popularity in the global market. This turmeric is suitable for export purposes. It is very popular in the US and other countries.

OTHER VARIETIES

Other than Alleppey Finger Turmeric there are so many varieties avalable in India. India is home to more than 30 different varieties of turmeric cultivars. These cultivars are typically identified by the name of the place in which they are cultivated viz., Alleppey finger turmeric, Erode turmeric, Waigaon turmeric, Wayanad turmeric, Salem turmeric etc. Wayanad turmeric is another promising cultivar from Kerala which is mainly cultivated in Wayanad district.

CONCLUSION

Even though it is a treasure of Kerala most of the people are unaware of it. Due to the advent of improved varieties, the age-old traditional cultivars are now eroding. During the parliamentary standing committee meeting held at Kochi the members of All India Spices Export Forum had recently raised the issue of non-availability of these turmeric varieties for export purposes. So further researches should be done in these varieties and promotion from Government side is essential for the increase in production potential for export purposes.

REFERENCES

Anu, T.S. 2019.Collection and evaluation of Wayanad turmeric (CurcumalongaL.) for yield and quality.M.Sc. (Ag) thesis. Kerala Agricultural University, Thrissur, 124p.

Aswathi, A. P., Raghav, S. B. and Prasath, D. 2023.Assessment of genetic variation in turmeric (Curcuma longa L.) varieties based on morphological and molecular characterization. Genet.Resour. Crop Evol.70(1):147-158.

Introduction

Global population is projected to reach 9 billion by 2050. At the same time the number of young people (aged 15 to 24 years) is also expected to increase to 1.3 billion by 2050, accounting for almost 14 percent of the projected global population. Most of them are in developing countries namely Africa and Asia, where more than half of the population are still living in rural areas (UNDESA, 2011). Unemployment, under employment and poverty are the continuous challenges faced by the rural youth. Despite the fact that agricultural sector's have enough potential to provide income-generating opportunities for rural youth, the challenges related specifically to youth participation in this sector and

RE-ORIENTING YOUTH IN AGRICULTURE FOR BETTER PROSPERITY

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options for overcoming them need to be extensively looked into. Rural youth residing in villages are migrating to urban areas in spite of the enormous scope in the rural areas particularly in farming activities. In India, agriculture is the primary occupation and our economy's growth and development are also based on the export of agricultural goods, and hence agriculture can never be viewed as a supplementary sector.

A single business should handle production, processing, value addition, and marketing in order to maximize the company's economic growth by managing the complete value chain. When the agriculture industry expands in rural regions by making use of the local resources, it gives rural youth possibilities in their own or nearby villages and can indirectly help to ease the problem of rural unemployment and youth migration to cities. The government offers start-ups and other privately owned businesses a helping hand. Youth need to be informed about government initiatives and other forms of hand holding support offered by various R&D organizations so they can start their own business and provide jobs instead.

Status of agriculture in India

India is a country rich with varied diversities and abundantly rich in natural resources. India is one of the major players in the agriculture sector worldwide and it is the primary source of livelihood for approximately 55% of the population. India has the world's largest cattle herd (buffaloes), largest area under wheat, rice, and cotton, and is the largest producer of milk, pulses, and spices in the world. It is the country which is the second-largest producer of fruits, vegetables, tea, cultured fish, cotton, sugarcane, wheat and rice. The country has around 195 m ha under cultivation of which around 63 percent are rainfed (roughly 125m ha) while 37 percent are irrigated (70m ha). In addition, forests cover nearly 65m ha of land. Around 62 percent of India's population is reliant on it for survival (Gupta & Nagar, 2017). Agriculture is a crucial sector of Indian economy as it contributes about 20.19 percent of GDP (DAC&FW Annual Report, 2020-21). In the ancient days agriculture was practised for household consumption only, and as the days go by new technologies and developments resulted in enhanced crop production and people started earning from agriculture too and it was made commercial. But there are several adversities that emerged in the socioeconomic areas along with the environmental hazards (Bhatt et al., 2019). But, advanced farming employing sensors and other scientific instruments with latest techniques and application of artificial intelligence is now taking place on a global scale. It is an

effective means of saving money, reducing the environmental impact, increasing the quality and yield.

Demand for agricultural products may be increased by the growth of new subsidiary industries. As a result, companies grow and the re-investment of non farm earnings into agriculture which result in the creation of more productive linkages between the farm and non farm sectors. In India, the urban population was just 30% in 2010, according to a UNDP assessment, but it is expected to increase to 40% in 2030 and over 50% by 2045. India's urban population is expected to expand from 3.5 billion to more than 6 billion by 2050. But, areas under cultivation grow at a rate of only 2% each year (Agarwal and Sinha, 2017). In many rural areas, agricultural knowledge and farming know-how are passed on from generation to generation. Youth migrate to urban areas in search of lucrative jobs and for a better living. So to make youth participate in agricultural work the farming knowledge and advice need to be provided in a more coordinated, systematic and effective way so as to kindle their thoughts and motivate them to be engaged in agriculture.

Youth in India

Young people are a crucial human resource for promoting development in a country. They are also the movers of change in the socio-economic and technological innovation sectors. Youth is the driving force in any country which leads to its growth and economic development. Today's youth are tomorrow's leaders. According to national youth policy, persons within the age group of 15 - 35 years are defined as young. At present, 35% of the total population is in the age group of 15 - 35 years, out of which 75% live in rural areas. Migration of rural youth to cities is around 45% in the country, and it is estimated that only about 5% of youth are engaged in agriculture. The sustainability of agriculture depends upon many factors and the most significant one among them is the human resource. The challenges faced in agriculture are multifarious including technological, economical, and environmental and policy changes. These challenges are to be addressed in a better way to make agriculture more profitable. The thinking and mindset of the youth should be changed and they should realise the importance of agriculture and its future. Our country cannot prosper without agriculture, as it has an agrarian economy.

Rural-urban migration is defined as the population shifting to a better place searching for basic living requirements like food, shelter, and other needs. Urban migration is largely observed in our country as the urban life is preferred by the rural youth due to the elite job opportunities and the standard of living is better off and more modernised when compared to rural areas. Migration always take place when people think there are lot of scope in bigger cities which can help them to lead a more meaningful life. Situation which encourages people to move out of their own villages may be poverty, lack of basic amenities, backwardness and at the same time the dragging factors in the urban cities include more work opportunities, higher wages and better living conditions. The most affected sector due to urban migration is the agricultural sector which clearly indicates the participation of youth involved in agriculture is showing a declining trend. In the long run this is not a favourable situation as there will be an imbalance among various sectors and few sectors will be flooded with more takers which end in disguise under employment. The organisations like Krishi Vigyan Kendras (KVKs), NABARD Farmer's Club, and National Skill Development Council (NSDC) are working to teach skills to rural youth, and their activities need to be strengthened. The Indian government recently unveiled programmes like skill India, stand-up India, start-up India, and Pradan Manthri Krishi Vikas Yojana (PMKVY). These programmes identify a large number of rural youngsters, offer the necessary training, and impart the necessary skills to start a diverse agricultural business. Realizing the importance of rural youth in agricultural development especially from the point of view of food security of the country and to empower rural youth, the Indian Council of Agricultural

Research (ICAR) has initiated a programme on "Attracting and Retaining Youth in Agriculture (ARYA) during 2015- 16. Under this scheme, special efforts are being taken up to attract the rural youth under the age of 35 years in agriculture to provide income generating opportunities and engage them in agriculture.

Migration of youth from agriculture

Rural areas are the home for agriculture but at the same time the facilities available in rural areas are very limited. The urban areas are progressing at a much faster rate than rural areas. Better life style facilities, educational access, medical facilities, and other basic needs are on the higher side which are attracting the rural youth towards the cities. Aspirations of the youth determine the area of work they prefer. If they witness that farming is profitable and help them to live a descent living then they may continue their traditional job. The challenges existing in agriculture are to be studied in depth and it should be addressed to keep rural youth in their villages. Drivers of rural youth migration need to be understood in depth. Farming is the main family occupation in rural areas but most of the youth are not interested to work in their fields instead they aim to leave their native villages in search of jobs. For most of the youth, agriculture is the last accepted option since they have a notion that agriculture is very risky and not given due recognition in the society. With depleting water sources and due to climatic vagaries, there is no assurance of crop, assured market and prices which are some issues in agriculture. Secured income cannot be likely in farming as it is just a gambling with the environment. Income creation in agriculture decides the continuation of agriculture as an occupation. Even the youth are prepared to do small jobs in the cities but reluctant to get involved in agriculture as their family did. Rural youth face many hurdles in trying to earn a livelihood. Pressure on arable land is high in many parts of the country, making it difficult to start a farm. Youth often also lack access to credit, and many other productive resources necessary for agriculture. These are some of the impediments which pull back the youth from agriculture.

Land system

Land – a notion which broadly includes climate, topography, vegetation, soils and other natural resources – is the basis for agriculture, and the interaction between these components is vital for determining the productivity and sustainability of agro-ecosystems. Especially in the face of climate change and variability, selecting the right land uses for given biophysical and socio-economic conditions is essential for minimizing land degradation, rehabilitating degraded land, ensuring the sustainable use of land resources, and maximizing resilience. To do agriculture, land is the basic resource. Youth do not have land ownership and this becomes a constraint for them to access credit. This is due to the inheritance system in which the land is divided among the

children in the household and the land gets further fragmented. They do not have the full right to use the land and raise the crop they want. Their role in decision making is very limited and hence they have to depend upon their family members to make decisions. They lack the facility to do farming either independently or on their own. Raising of crop depends upon the quality of the land. Land can be made fertile by adopting proper land reclamation and management practices. Youth should be bestowed with the freedom to take decisions and may be made involved in agriculture along with the family. Family labour is the indirect cost realised by the family while doing any agricultural operations which reduces the cost of cultivation and enhances the income through marketing.

Access to education

It is well known that overcoming development obstacles in rural regions requires a strong commitment to education. Rural children's education and food security are directly related, but it has also been shown that basic numeracy and literacy skills help to improve farmers' livelihoods. Education provides access to knowledge and information. Education provides the youth with farming skills and productive capabilities, improves their knowledge and it engenders the change in their attitude and behaviour. An educated individual, understands the new technologies with more ease and determine to adopt the innovations for enhancing income. Even in this era of artificial intelligence and other smart farming systems youth should have access to education to have a base knowledge to use AI, IoT and drones. Education makes a person to become aware about himself and also about the society and environment in which he is living. Education helps in better decision making and imbibes self confidence in ones walk of life. It brings about a change in one's life and it has strong influence in youth's aspiration and their goal.

Access to knowledge and technology

Due to the advancements in technologies, agriculture is witnessing quite a lot of changes in method of cultivation, processing and value addition. Introduction of smart farming with the help of IoT devices is revolutionising agriculture. Youth should have ingress to these advanced technologies to make agriculture a profitable venture. Poor and inadequate education limits productivity and acquisition of skills, while insufficient access to knowledge and information can hinder the development of entrepreneurial ventures. Social media platforms and other knowledge sharing domains are available in this information era and hence information access is not a limiting factor. Youth should have passion towards agriculture and they have to be in line to access the technologies.

Access to market

Marketing is a prime domain which determines the future of agriculture production. In ancient times farmers produced food for self-consumption or for exchange with others mostly in the same village or nearby places and they were self reliant. But, now production environment is towards commercialisation rather than self- reliance and technological advancement has led to a substantial increase in farm production and consequently the larger marketable and marketed surplus. The improved production leads to increasing urbanization, income, life style change and food habits of the consumers and increasing linkages with the overseas market. Further, increasing demand for processed or semi-processed food products ready to cook food requires movement of food commodities from producer to consumers in the form of value added products. Perishability and seasonal availability of the farm products are the challenges in the marketing sector. It leads to intra-year seasonality in the prices. Bulkiness of the products is another issue which makes their transportation and storage difficult and expensive. Variation in quality of products makes their grading and standardization somewhat difficult. The supply of agricultural products is uncertain and irregular because of the dependence of agricultural system deeply on the nature. Small size of holding and scattered production makes the estimation of supply difficult and also creates problem in marketing. These challenges

are to be addressed to improve agriculture marketing.

Access to financial resources

The agriculture sector in India is one among the biggest employers of labour force and hence agriculture finance plays a significant role. Agricultural finance caters to funding activities associated to agricultural activities. This can include crop cultivation, production, storage, and marketing of products. Finance is the basic to develop any business or create any lucrative job. Even to do agriculture financial support is a pre requisite. If cultivation of crop is to be done in a profitable way the cost of cultivation has to be reduced. In India the sources of finance are institutional and non institutional. Institutional sources are related to institutions such as cooperatives, regional rural banks (RRBs) or scheduled commercial banks (SCBs). Non-institutional refers to financing support offered by traders, money lenders or other individuals like agents, landlords or even family members. To avail credit, agricultural farmers mostly go for informal sources even though they charges them with exorbitant interest as the process of availing credit is simple. If the finance to take up agriculture activities are liberalised and if the farmers can get finance easily, it may inspire young people to do agriculture. If subsidies are given for agricultural inputs it always supports the farmers by bringing equity between the rich and poor farmers and it supports them with reduced input cost.

Way forward

- Unutilised land to be made productive by giving initial financial support for the youth to do agriculture on lease tenure system or by acquisition.
- Education in rural areas needs to be more oriented towards the knowledge and skill development of youth and even the young generation may be exposed to agriculture in the primary and secondary classes by including agriculture as a subject.
- Technical skill development of rural youth is to be met by training and capacity building to upgrade their knowledge and skill and to empower them to take up a job on their own in the agricultural sector.
- Awareness creation and motivating them to adopt AI based agriculture which enhances their creativity in practising agriculture and the youth can be introduced to the new world of AI.
- Linking with national and international markets helps in realising more prices and continuous demand for the products and makes the market chain operates in a more profitable way.
- Agricultural products for all time have good export potential. Export policies are to be made more flexible to support more export of products from our country.
- More credit schemes are to be made available and accessible to youth with an easy to approach mode.
- Linkages are to be strengthened among the various actors in the production chain and the youth should be connected with the industries.
- Hand holding support to the farm youth should come from different R& D departments.
- Extension agencies should motivate the youth to take up farming by creating awareness about the prospects of agriculture.

Reference

Agarwal, H. P and Sinha, R. 2017. Urban farming - A sustainable model for Indian cities. International Journal on Emerging Technologies, 8(1): 236-242.

Bhatt, H., Bhushan, B and Kumar, N. 2019. IoT: the Current scenario and role of sensors involved in smart agriculture. International Journal of Recent Technology and Engineering, 8(4), 12011-12023.

Annual Report (2020-21), Department of Agriculture, Cooperation & Farmers' Welfare (DAC&FW). Available at https://agricoop.nic.in/en/whatsnew

Gupta, G and Nagar, M. 2017. Agriculture sector in India: As a career. International Journal on Arts, Management and Humanities 6(2): 01-06.

UNDESA. 2011. World population prospects: the 2010 revision highlights and advance tables. Working Paper No. ESA/WP. 220.

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Kumol Saul

Assam's Magical Grain

Kumol Saul, a local variety of rice in the picturesque North-Eastern state of Assam, is region's well-kept secret. This indigenous grain has some magical properties. It is a type of winter rice, grown in the lower reaches of Assam. Its preparation involves a unique process, in which the rice paddy is first steamed and then drained using a 'dhenki', which is indigenous to Assam. But what sets Kumol saul apart from its peers? The magic lies in its preparation. While most varieties of rice require a long time of boiling and cooking, Kumol saul saves all the effort. Just dip it in hot water and it's ready to use in minutes! The simplicity of its preparation has earned it the name "Magic Rice of Assam".

Cultural and Culinary Significance

The rice is mainly

cultivated in Majuli, the world's largest river island located in the Brahmaputra River. The tradition is that Kumol saul, after being soaked overnight in hot water, is eaten the next morning with mustard oil and onions. During festivals in Assam, this rice is usually mixed with banana powder and jaggery or mashed potatoes and pickles. In Assam, breakfast often consists of Jolpan – Xandoh, Chira, Muri and of course, Kumol saul, a delightful mixture of grains with curd, jaggery and cream.

The Unique Traits of Kumol I Rice

Kumol saul has a soft texture unlike traditional hard rice grains. This softness is attributed to its low amylose content, a type of starch. The inherent versatility of rice ensures its adaptability to a range of cuisines beyond traditional consumption patterns. Another feather in its cap is its easy digestibility. When steeped, it produces a mild aroma and emerges, showing subtly sweet undertones, making it perfect for desserts when combined with jaggery.

Nutritionally, Kumol saul is a treasure trove, rich in iron, zinc, calcium and vitamins such as thiamine and niacin. Its no-cook preparation makes it an attractive proposition as a healthy fast food, especially for the younger generation.

Recognition and GI Tag

Confirming its distinct identity, Kumol saul has been given a Geographical Indication (GI) tag by the Government of India's Intellectual Property India body. This accolade comes on the heels of another Assamese rice variety, Joha, celebrated for its aromatic properties. Recently, Kerala has started cultivating Kumol saul from Majuli at the State Seed Farm in Aluva, which shows the grain's potential to become a pan-Indian favourite.

In essence, Kumol saul stands as a testament to India's rich agricultural diversity, reflecting the nation's culinary heritage and the untapped potential of regional grains.

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