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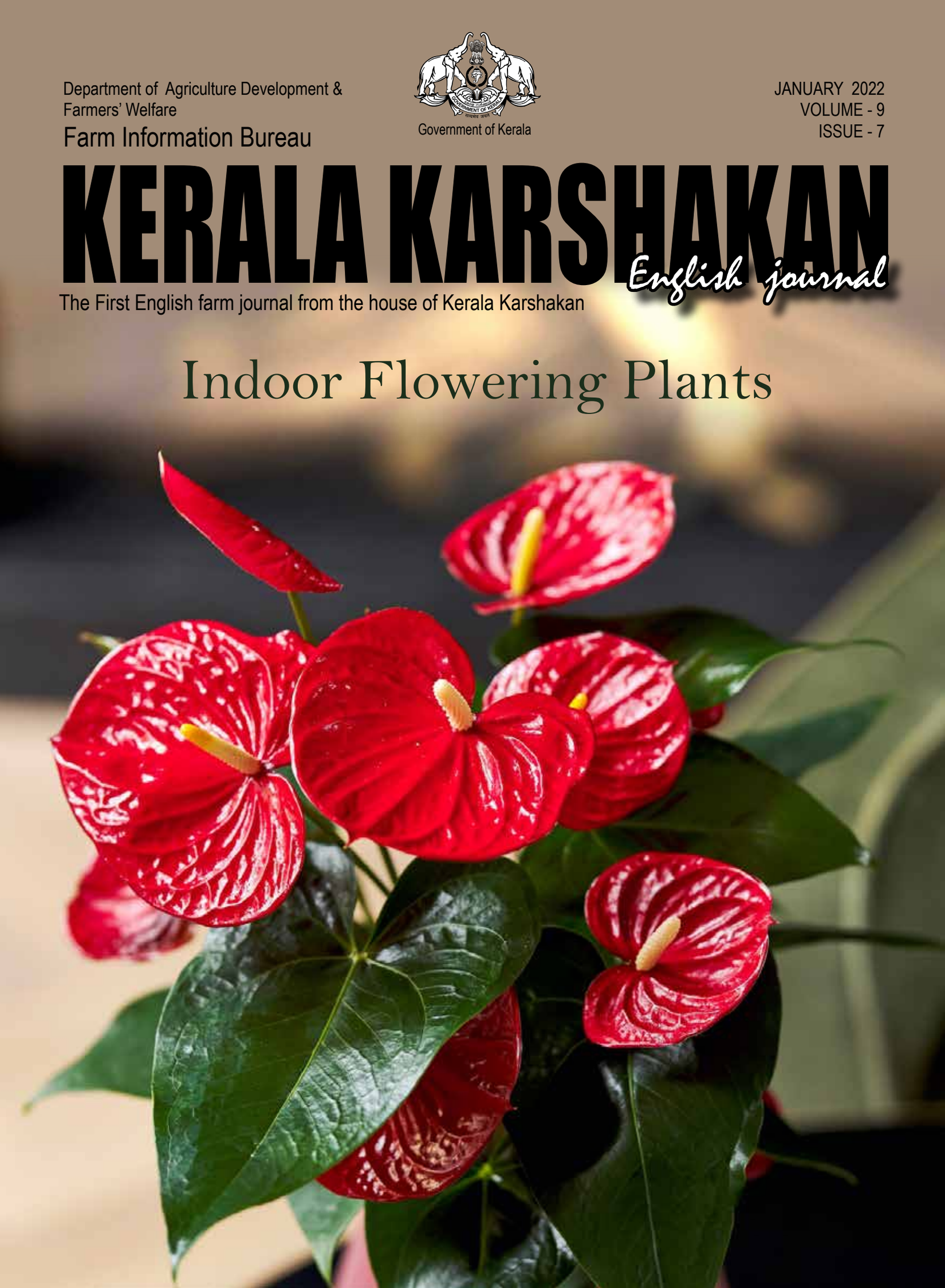
KERALA KARSHAKAN

English journal

The First English farm journal from the house of Kerala Karshakan

Indoor Flowering Plants



INSIDE KERALA KARSHAKAN

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JANUARY 2022 Volume - 9 Issue - 7

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The First English farm journal from the house of Kerala Karshakan

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Indoor Flowering Plants

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Anthurium

Flowers always make people better, happier and more helpful; they are sunshine, food, and medicine to the soul- Luther Burbank. But, Can we grow these flowers under the roof ???? The answer is yes. We do have plants which bear beautiful, colourful flowers in indoor conditions too.

Anthurium

Anthurium is an evergreen, tropical herbaceous plant cultivated for its colourful spathe and unusual attractive foliage. They symbolize hospitality. Because of its attractive, long-lasting flowers, Anthurium is popular both as an exotic cut-flower crop and as a flowering potted-plant. The Anthurium plant is grown as a houseplant in cooler areas.

Orchids

Anthuriums can tolerate all levels of indirect light, but those growing in low light will have fewer flowers and grow slower. These plants cannot tolerate direct light, as this can burn the leaves. They grow best in bright, indirect light.To grow Anthurium, the media should have good drainage and little water holding capacity. Anthurium plants don't thrive well in continually moist soil.

Make sure to water anthurium plant regularly, but don't overwater it. Watering should be done only when the soil is dry to the touch. The plant is susceptible to root rot, so too much water can cause the roots to die. If you allow the plant to become too dry in a pot, it will slow down its growth and the rootball will be difficult to re-wet. If the rootball becomes too dry in the pot, soak the pot the anthurium plant for an hour to rehydrate it.

Anthurium plants do not require too much fertilizer. The plant only needs to be fertilized once every three to four months. To get the best blooms, use a fertilizer that has higher phosphorus content.

Orchids

Orchids are mesmerizing flowers which are praised for their long lasting flowers.These plants prefer filtered light, fluctuating temperatures and limited water. Temperature affects an orchid's overall growth especially its bloom habits. The most critical time for orchids is winter, when many of them are preparing to bloom. Orchids are classified into three types based on their winter temperature needs: coo, intermediate, and warm growing. Cool-growing orchids enjoy night temperatures in winter around 50°F and daytime temperatures not exceeding 70°F. Intermediate-growing orchids prefer minimum winter-temperature around 60° F and daytime temperatures from 70°F to 85°F. Most orchids best suited for growing indoors are in the intermediate group. Orchids flourish under bright, indirect light. Full eastern or western

Spathiphyllum

exposure or indirect southern exposure usually provides enough light. However, as with temperature, specific orchids may require a certain light intensity. When buying an orchid, check the label for its light preference, then observe how much light the orchid actually receives. Symptoms of excessive light are sun burn, yellowish foliage, and a plant that looks weak and dehydrated. On the other hand, if you bought an orchid in bloom and it did not rebloom the following year, even though the foliage looks green and full, consider giving it more light. Also make sure the temperature range is correct.Orchids need to be repotted when one or more of the following occurs: the orchid is top heavy, a new orchid shoot is growing outside the container, the potting mix has deteriorated, or the orchid needs dividing

Clivia

Indoor clivias prefer bright, indirect light while those grown outdoors need shade. They also like rich, well-draining potting mix or soilless mix. The growing media should be kept evenly moist during spring and summer months and allowed to dryout slightly for a period of two months during winter. Except for two months in early winter, clivia should be watered any time the growing medium is dry to a depth of one inch. Dig your finger in to the first knuckle, and if the soil is dry to the touch, then water thoroughly. Apply a complete liquid houseplant fertilizer in early spring, as the flower buds appear which benefits the plant. Yellow and outer leaves should be removed periodically.

Clivias don't appreciate root disturbances, however, repotting can be done every three to five years in spring once the flowers have faded. Although difficult to propagate, division is the preferred method. When propagated from seed, it generally takes about three to five years before plants will bloom whereas offshoots take

Azaleas

about one or two years.

Spathiphyllum

Spathiphyllums which are also known as Peace lilies are a popular choice for offices and homes. When it comes to indoor plants, peace lily plants are some of the easiest to care for. However, though peace lily plant care is easy, proper growing conditions are still important.

These lovely plants not only brighten up a living space, but are also excellent at cleaning the air of the room. Most commonly, these plants have dark green leaves and white flowers. Like many popular indoor plants, peace lilies enjoy medium to low light. Peace lilies that are placed in more light tend to produce lovely white spathes and flowers more, while peace lilies in low Light will bloom less and will look more like a traditional foliage plant.

One of the most common mistakes in the care of peace lilies is overwatering. Peace lilies are far more tolerant to underwatering than overwatering, which is one of the most common reasons for a

Gardenia

peace lily to die. So, you should never water peace lily plants on a schedule. Rather, you should check them once a week to see if they need to be watered.Simply touch the top of the soil to see if it is dry. If it is, then water it.If the soil is still damp, the plant does not need to be watered. Some people will go so far as to wait until their peace lily to droop before watering their plant. As these plants are very drought tolerant, this method does not harm the plant and will prevent overwatering. Peace lilies also benefit from repotting or dividing when they outgrow their containers. Signs that a peace lily plant has outgrown its container include drooping less than a week after being watered and crowded, deformed leaf growth. If you are repotting, move the plant into a pot that is at least 2 inches (5 cm.) larger than its current pot. If you are dividing, use a sharp knife to cut through the center of the rootball and replant each half in its own container.

Since the wide leaves on peace lilies tend to be a dust magnet, you should either wash or wipe down the leaves at least once a year. This will help to process sunlight better. Washing the plant can be done by either setting it in the bath and giving it a short shower or by placing it in a sink and letting the tap run over the leaves. Alternatively, the leaves of peace lily plant can also be wiped down with a damp cloth. Avoid using commercial leaf shine products, as these can clog the pores of the plant.

Azaleas

Azalea can also be grown as an indoor plant like any other houseplant, but as with other blooming plants, there are a few tricks one should know about the care of indoor azalea if we want to keep them blooming year after year.They thrive in cool, filtered sun. Azaleas as houseplants do best at cooler temperatures, ideally around 60-65^{0}F (16-18^{0}C). Cooler temperatures will also help the blooms last longer. Keep them well lit, but out of direct sun. Moisture should be the greatest concern in the care of indoor azaleas. Never allow the plant to dry out. While watering from the top may provide sufficient care, indoor azaleas enjoy the occasional dunk, pot and all, in a larger container of water. When the bubbles stop, pull it out, and let it drain. One should not let these plants dry out. Keep them damp, not soggy, and don't fertilize until flowering is complete.

Once the blooms have faded, give your plant a little more light and fertilize it with an all-purpose liquid fertilizer every two weeks. When the weather warms, plant it, pot and all, in your outdoor garden. Rather, keep the pot in a semi-shaded area indoors or out. Since they prefer slightly acidic soil, we may have to use a fertilizer manufactured for that purpose. Shape the plant in midsummer, cutting back any straggly growth and keep it well watered. Bring it back indoors before the first frost of autumn. Between early November and early January, greenhouse azaleas need temperatures ranging between 40^{0}F and 50^0 F (4-10^0 C). This is essential for growing azalea as a houseplant.

Gardenia

We can grow gardenia shrubs successfully both in outdoor and indoor condition. However, there are a few things to be taken care of while growing gardenias indoor.

Growing gardenias indoors, requires close attention to humidity, light, and pest control. If placed in the correct environment and given proper care, an indoor gardenia will reward you with glossy, green leaves and aromatic flowers.

Indoor gardenias require cool temperatures, moderate humidity, and plenty of bright light to thrive. The requirement of light, at least half a day of direct sun, and be in a room with a temperature that is about 64^0 F. (18^{0}C.) during the day and 55^0 F (13^{0}C) at night with appropriate humidity which slightly difficult to maintain. The drying nature of most heat can cause a once beautiful gardenia to fall to pieces, literally.

There are a few ways to increase indoor humidity. The first is to group houseplants close together, the second is to spray a light mist of water on foliage during the early morning hours, and the third is to run a humidifier. Provide water when the soil is dry to touch and add fertilizer during the growing season. Remove woody stems to encourage prolific blooming.

SPICES AS IMMUNITY BOOSTERS IN THE COVID SCENARIO

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Since the prehistoric era, spices and its products are being employed for their medicinal properties. Of all the countries, India has always been home to several spices that are widely used in folk medicine. Among the 80 spices grown in various parts of the world, a major portion comes from Asia. While the natural path for enhancing the health and promoting wellness is the need of the hour the emphasis on healthy eating is drawing attention with the referral of spices as the

critical ingredients. As they say "We are the food we eat, the books we read...." Thus the food we consume has a great impact on our day to day routine. Spices get along with them many health benefits, including enrichment and protection against diseases, viruses etc. Since time immemorial they find its use as traditional foods to stimulate appetite, enhance digestion, relieve stress, and boost immunity. It is well known a sound body system helps fight various pathogens and bacteria. Due to the COVID-19 pandemic, there has been growing interest towards alternative approaches to strengthen the human immune system, and build the earliest security against the deadly virus.

It is important to make sure our immune system is extremely strong to have healthy life. And with this pandemic, it is crucial to build our defenses against it. To stay fit and make our immune system strong, we need to do things diligently: exercise regularly and follow healthy food habits. There are numerous herbs, spices and roots that enhance the immune system naturally. In addition they also offer lots of other health benefits, including the ease in digestion and also ensure mental soundness. Synchronous to a situation while the world is a rollercoaster under the pandemic COVID-19, there is a need to use spices in our daily diet to improve immunity.

Following are the spices

that need to be included in the diet which in turn helps in imparting immunity.

Clove

So called the winter spice, it is the one that has unimaginable body defending abilities. Clove is enriched with eugenol content and has antibacterial and antifungal properties. It promotes digestion and improves circulation. It is a pain reliever, hence used as a mild anesthetic for toothaches. It also helps to get rid of intestinal gas and fights nausea. In Ayurveda it is employed to cure cough and cold, along with resisting infections. Hence using this in our daily food stuff preparations like gravies, teas, hot water it serves a good purpose.

Cinnamon

Known as sweet wood, Cinnamon is rich in antioxidants like polyphenols and proanthocyanidins with its principle component like cinnamaldehyde, eugenol, cinnamic acid that builds up immunity. It helps in decreasing the respiratory problems along with infections due to its antiviral, antibacterial and antifungal properties. It is commonly used to treat diarrhoea, depression and circulation.

Garlic

It is one of the most essential components of spice blend, used by the Egyptians since 3700 B.C to provide strength and cure diseases. It is known to stimulate digestive system, prevent the heart disease, and also in improving body functions. It has antimicrobial, antibiotic, and anti-inflammatory properties. It also improves psychological state of mind and increases the thiamine (vitamin B1) absorption in the body and prevents beriberi.

Ginger

Renowned as the powerful immunity booster, this is the oldest and more popular medicinal spice that has anti-inflammatory, antifungal, and anti-cancer properties which is also noted for its soothing effect on the stomach as it has been a popular traditional medicine.

Cinnamon

Ginger

Ginger has been extensively used for curing colds and coughs, nausea, asthma, travel sickness, morning sickness, arthritis, gastrointestinal complaints and even depression.

Holy Basil

This plant is enriched with nutrients, vitamins, and minerals, and has Eugenol, an active component that keeps away bacteria, fungi and other disease causing agents thereby reducing stress and plasma glucose levels. In Asia basil is used for most stomach disorders, cramps, diarrhea, headaches,

Garlic

Fenugreek

Holy Basil

coughs and cold.

Fenugreek

It is known to impart flavor and is also used in medicines. It acts as a natural anti-oxidant and strengthens body. Herbal tea made with fenugreek, honey and lemon is a traditional remedy to treat fever. It improves digestion, functions as laxative, cures constipation and sore throats.

Turmeric

Called yellow root, Turmeric is familiar for its healing powers. With its bioactive compound curcumin; It also contains Lipo polysaccharide, that helps fight against viruses and bacteria that stimulate the human immune system. In Indian culture, it is given to heal the uterus after childbirth and help restore loss of blood. In Ayurveda medicine it is used as an anticancer agent to lower cholesterol. Like good old customs, Haldi Doodh is used in diet to boost immunity; Called yellow root, Turmeric is familiar for its healing powers.

Unlike allopathic drugs like antibiotics, which can impart serious side effects, most of the spices and their products prove safe. This in fact is a time when all of us need to take special measures to stay safe during the pandemic. With the virus spreading in many countries, including India wherein the cases have been rising day by day, fighting the infection is the need of the hour.

This can be achieved if we protect ourselves and follow the necessary precautions. With lots of climatic changes, there is also chance that our body is prone to cough and cold. The one that freed us from this is including immunity boosting ingredients in our daily diet, particularly spices which can keep us balanced and strong.

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Apis dorsata L

The Giant honey bee and its characteristics

Apis dorsata L is the giant honey bee of South and Southeast Asia, found mainly in forested areas such as the Terai of Nepal. They are typically around 17 - 20 mm (0.7 - 0.8 in) long. Nests are mainly built in exposed places far off the ground, like on tree limbs, under cliff overhangs and sometimes on buildings. These social bees are known for their aggressive defense strategies and vicious behavior when disturbed. Though,giant honey bee is not domesticated, indigenous people have traditionally used this species as a source of honey and beeswax, by a practice known as honey hunting.

Subspecies

Michael S. Engel identified the following subspecies of giant honey bee

- *A. d. dorsata;* (Indian giant

honey bee), primarily from India

- *A. d. binghami* Cockerell; (Indonesian giant honey bee), from Malaysia and Indonesia
- *A. d. breviligula Maa;* (Philippine giant honey bee), from the Philippines
- *A.d.laboriosa Fabricius;* (Himalayan giant honey bee), from India, Nepal, Bhutan, Myanmar, Laos, Vietnam and southern China.

Recent research has removed laboriosa from *A. dorsata*, as a separate species, with supporting evidence including a significant region of sympatry *A. laboriosa* is hardly distinct morphologically from the nominate subspecies of *dorsata* (darker abdomen, longer thoracic hair) but has different housekeeping and swarming behavior, allowing it to survive at high altitudes. In addition, little gene flow has occurred between *A. dorsata* and *A. laboriosa* for millions of years; accordingly, some authors have previously classified it as a distinct species.

Likewise, the southeastern taxon *A. d. binghami* seems also to be potentially distinct. The limits of their ranges in Indochina and the possible distinctness of the geographically distant Philippines population require more study. However, the use of the taxonomic rank of "subspecies" is typical for geographically discrete populations, so the difference in opinion here is whether to recognize the rank of subspecies or not (i.e., no one is disputing that they are distinct lineages, the dispute is over whether or not to call them "species").

Nests

A nest of *A. dorsata*, consis of a single exposed hanging comb: The bottom of the comb has a number of un occupied hexagonal cells.

Apis dorsata differs from

the other bees in its genus in terms of nest design. Each colony consists of a single vertical comb made of workers' wax suspended from above, and the comb is typically covered by a dense mass of bees in several layers. The nests vary in size, reaching up to 1 metre. Each cell within the comb is hexagonal in shape. *Apis dorsata* store their honey in an upper corner of the nest. The same size and type of cells are used to rear larvae. Nests are constructed in the open and in elevated locations, such as on urban buildings or tall trees. These bees rarely build nests on old or weak buildings for safety concerns. *Apis dorsata* can form dense aggregations at one nesting site, sometimes with up to 200 colonies in one tree.Each colony can have up to 100,000 bees and is separated by only a few centimeters from the other colonies in an aggregation. Some colonies also exhibit patterns of nest recognition, in which they return to the same nesting sites post migration.

Colony initiation

There are two methods of reproductive swarming in which *Apis dorsata* initiates new colonies, which usually occurs in October or November. The most common occurs when a queen flies away from the original nest slowly and a swarm of workers follows her. This new cluster of bees can be temporary, or they can permanently move to a new nesting site. The distance these bees travel is unknown, but some have been observed to travel about 500 meters away from the original nest. The second, rarer method is referred to as "budding." In budding, a group of workers leave the natal nest to form a new colony at a nesting site about 1 metre away from the original.

A non-reproductive method of colony initiation is absconding. Absconding refers to when an entire colony moves to a new location. As a colony is formed, multiple curtains, essentially layers, of bees are formed around the developing nest. Colony initiation is related to the migratory patterns of these bees.

Colony migration and decline

As a colony is initiated, the migration depends on foraging resources and predation risks. These bees travel to different sites depending on the blooming season of flowers.There are about 100,000 members in each colony and each colony resides in one nesting site for about 3–4 months at a time. Colonies tend to decline when resources, such as food, honey, and pollen, are depleted. Colonies decline during the rainy and summer seasons because of the instability of foraging sources due to climate change.

Mating

Some drones and the queen fly away from the nest and mate on the wing. This is called nuptial flight.The drone flights are comparatively shorter than those of other Asian honeybee species. The *Apis dorsata* flights occur around dusk for 13 minutes on average. *Apis dorsata* exhibit high degrees of polyandry, with many drones mating with the queen. In fact, *Apis dorsata fabricius* is known to have the highest levels of polyandry among all social insects. In general, this bee population experiences extreme multiple matings. This may be attributed to the short duration of flight times for mating. During mating, the drones fly to "drone congregation areas" (DCAs). There is sufficient evidence to conclude that each aggregation has its own DCA since there is more genetic relatedness within aggregations and because of the short duration and distance traveled during the mating flight.

Foraging

A. dorsata foragers can travel farther than *A. cerana* and *A. florea*, which travel to a maximum of 500 meters; however, 72% of observed *A. dorsata* foragers traveled no more than 400 meters. Nocturnal behavior has also been observed in *Apis dorsata*.

Honey

Rock bees are ferocious and difficult to rear. The Asian rock bees (*Apis dorsata*) can produce large amounts of honey in comparison to other honey bees.They produce about 36 Kg honey per comb per year. Honey (*Apis dorsata*) supplements has the effect of increasing bone strength in ovariectomized rat as animal models of osteoporosis, so that honey (*Apis dorsata*) supplements has the potential to be used as an alternative treatment for osteoporosis apart from other medicinal properties.

INSECTICIDE RESISTANCE

CURRENT STATUS AND MANAGEMENT

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Introduction

Insecticides are considered as one of the indispensable inputs in modern agriculture using high yielding varieties and intensive cropping. Excessive and indiscriminate use of insecticides has led to the problems of insecticide resistance, pest resurgence, accumulation of harmful residues and toxicity to non-target organisms. Resistance to any xenobiotic molecule is a basic biological phenomenon found in every living organism, from microorganism to man. It is the innate power of an organism to resist and then modify those chemicals to which it may be exposed to harmless/ less harmful compounds. Insecticide resistance in agricultural systems has been recognized as one of the world's top environmental problems for nearly few decades and it is occurring in over 574 species of insects with importance to four orders: Coleoptera, Diptera, Lepidoptera, Hemiptera. Insecticide Resistance is defined as the "heritable change in the sensitivity of a pest population that is reflected in the repeated

failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species" (IRAC,2021). Development of insecticide resistance is a complex process depending directly on genetic, physiological, behavioural and ecological factors and indirectly on the volume and frequency of applications of insecticides.

History and status of Insecticide resistance: The first report of insecticide resistance was published by Melander in 1914 in San Jose scale to sulfur-lime at Washington, USA and at the national level, singhara beetle, *Galerucella birmanica* Jacoby showed resistance against DDT and BHC and in *Maruca vittrata* (Geyer) against quinalphos, fenvalerate and Lambacyhalothrin in Kerala. IRAC (Insecticide Resistance Action Committee) and APRD (Arthropod Pesticide Resistance Database) are the organizations involved in insecticide resistance worldwide and the current status of resistance are available in their respective websites. IRAC is formed in 1984 and is dedicated to prolong the effectiveness of insecticides and acaricides by countering resistance problems. It has developed a mode of action classification scheme. India stands fifth among the top 14 countries in the number of cases of resistance reported worldwide. APRD is a web-based resistance case entry system by Michigan State University. It provides tools to provide access to arthropod resistance information and current status of arthropod all over the globe. Top five resistant arthropods include Diamond back moth, European red mite, green peach aphid, Two spotted mite and Colarado potato beetle. According to APRD (2021), *Helico verpa armi gera* stand first in resistance with more than 185 cases reported all over India to 16 insecticides followed by *Plutella xyostella* with 103 cases against 24 insecticides.

How resistance occurs?

Insecticide resistance has been proposed to be a preadaptive phenomenon in the sense that, prior to an organism's exposure to a stressor (an insecticide), there already exist rare individuals who carry one or more resistance alleles (such as polymorphisms in the resistance allele sequence or increased expression of the resistance allele) that allow them to survive exposure to that stressor. The proportion of individuals carrying the resistance polymorphisms or alleles should increase following insecticide selection. The offspring of the resistant individuals will have an increased survival rate, and eventually resistant individuals will be the predominant group in the population. When a resistant population occurs, the pesticide is no longer useful for managing that specific pest and other management options must be sought out. However, if pest resistance is managed effectively, a pesticide can remain useful for growers to continue using into the future.

Mechanisms of Insecticide resistance

The major mechanisms of resistance are

1. Behavioral resistance: Behavioral resistance occurs when insects or mites are able to evade contact with insecticides through avoidance. This mechanism of resistance has been reported for several classes of insecticides, including organochlorines, organophosphates, carbamates and pyrethroids. Insects may simply quit feeding if they come across certain insecticides, or leave the area where spraying occurred. Behavioral resistance to Bt is shown by *Helicoverpa armi gera neonates* where they detect and avoid Bt cotton leaf discs compared to non-Bt leaf discs and larvae started feeding on other parts avoiding younger leaves and small squares where Bt accumulation is more (Yang et al., 2008).

2.Physiological resistance:

2.1: Penetration resistance:

Detect or recognize a danger and alter their behavior to avoid or reduce exposure to the insecticide toxin. Insects may simply quit feeding if they come across certain insecticides, or leave the area where spraying occurred. It is usually present along with other forms of resistance, and reduced penetration intensifies the effects of those other mechanisms. There are two mechanisms: Thickening of cuticle and Altered cuticle composition.

2.2. Altered target site resistance: The second most common mechanism is altered target-site resistance. It is the form of resistance caused by a change in the structure of the site or the number of sites where the pesticide causes toxicity to the insect. Some DDT, organophosphate and pyrethroid failures are due to

target-site resistance.

2.3. Metabolic resistance: Metabolic resistance is the most common mechanism and often presents the greatest challenge. Insects use their internal enzyme systems to break down insecticides. Resistant strains may possess greater levels or more efficient forms of these enzymes. In addition to being more efficient, these enzyme systems also may be broad spectrum, meaning they can degrade many different pesticides. Detoxifying enzymes present in insects include: MFO- cytochrome P450 monooxygenases (to all class of insecticides), hydrolases (including esterases) (to OP, carbamates and pyrethroids) and glutathione S-transferases (GSTs) (to DDT, OP and pyrethroids).

1.Cytochrome P450 monooxygenases and insecticide resistance in insects: P450 monooxygenases are ubiquitous enzymes, found from bacteria to mammals. They are involved in endogenous metabolism as well as in the metabolism of xenobiotics. Pang et al. (2016) detected elevated expression patterns of CYP6ER1 in *Nilaparvata lugens* from adult day one to a relatively high level between adult day nine and it was expressed highly in the fat body and midgut.

2.Glutathione S-transferases (GSTs) in insecticide resistance: The glutathione transferases (GSTs) are a large family of multifunctional enzymes involved in the detoxification of a wide range of xenobiotics including insecticides. Yin et al (2021) reported the presence of elevated PxGST2L gene in DBM and found that silencing of this gene increased its susceptibility towards chlorantraniliprole.

3.Esterases in insecticide resistance: Malathion detoxification in *Liposcelis bostry chophila* was found to be due to elevated levels of three esterase genes:LbEST1, LbEST2 and LbEST3 and silencing these induced susceptibility towards malathion (Wei et al, 2020).

Chemicals that block specific enzymes responsible for detoxification

Synergists are renowned inhibitors of detoxification enzymes and can play a successful role in pesticide resistance management programs. Piperonyl butoxide is a well-known synergist which inhibit cytochrome P450 monooxygenases and esterases. On the other hand, diethyl maleate and tri phenyl phosphate are reported to be a good inhibitor of GST and esterases. Study conducted by Pattappuet al. (2018) in Kerala revealed that piperonyl butoxide at 1:4 ratio showed higher synergism with the test insecticides against the resistant populations of *Spodoptera litura* (Fabricius) and proved to be an effective molecule alternate for breaking the resistance against conventional organophosphates and synthetic pyrethroids.

Special mechanisms:

Increased sequestration or excretion: Proteins bind to the toxin after the pesticides enter the insect body and transfer them away from the target site to various organelles such as fat body and haemolymph for storage.

Symbiotic- mediated resistance: Symbiotic microorganisms in the insect gut degrade pesticides. E.g., Mutualistic gut symbiotic bacteria in the mosquito *A. stephensi* can degrade Bt toxicity which facilitates the development of Bt resistance. Fenitrothion-degrading Burkholderia strains impart resistance in the bean bug, *Riptortus pedestris*.

Leg Autotomy: A Novel Mechanism of Protection Against Insecticide Poisoning in Diamondback Moth: - Autotomize one or both metathoracic legs after tarsal contact with insecticide residues. Moths that dropped legs after walking on fenvalerate residues had lower mortality and higher recovery from knockdown than those that did not autotomize (Mooreet al., 1988).

IRM: Insecticide Resistance Management

IRM aims to alter the selection pressure so that increases in the frequencies of resistance genes can be arrested or slowed. Different strategies in IRM are:

1-Management by Moderation: It attempts to preserve susceptibility of genes as a valuable resource by limiting chemical selection pressure that is applied.

2-Management by Saturation: Saturation of insect defense by means of non-target doses that are high enough to overcome resistance.

3 - Management by Multiple attack: It is based on the promise that control can be achieved through the action of several independently acting stresses, including insecticides, each exerting selection pressure that

is below the level which could lead to resistance.

Insecticide Resistance on Crop pests

1.Insecticide resistance and its management in *Bemisia tabaci*: (Hemiptera: Aleyrodidae) – it is a global, serious pest of vegetable, field and ornamental crops. Resistance to organophosphates (OPs), carbamates and neonicotenoids was reported from many countries. Approximately 650 reported cases of insecticide resistance in the genus Bemisia, and resistance was detected to more than 60 active ingredients (APRD, 2021).

2. *Helicoverpa armigera* (Hubner): A Leader in Insecticide Resistance:Cotton bollworm, *H.armi gera* exhibited widespread resistance to many of the insecticides are recorded worldwide. To manage insecticide resistance in cotton, the following measures are recommended.

Use of rational and sensible sequence of insecticides ad mixtures on the target species that minimize selection pressure. Growing intercrops such as Cowpea, soybean and blackgram that attract natural enemies. Destruction of crop residues and summer ploughing to destroy resting stage. Avoid using broad spectrum insecticides as they strongly disrupt natural enemy populations. Use of Bt/ Ha NPV/ neem based insecticides also helps to conserve natural enemies.

Insecticide Resistance on Bt:

Transgenic crops delivering Bt toxins are grown in millions of hectares. Although, the Bt crops increased the yield and reduced the use of conventional insecticide, their effectiveness would be decreased by evolution of resistance by insect pests. The number of resistant species has been increased worldwide, 13 cases of field-developed resistance to five Bt toxins in transgenic corn and cotton. Most of the resistance reported cases belongs to Cry1A family (Tabashniket al., 2014) by different mechanisms. Helicoverpazea is the first insect which acquired resistance against Bt crops. Growing refuge crops, scouting and application of insecticides and using multiple traits targeting the same pests are some of the IRM strategies adopted.

Conclusion: Resistance is a consequence of basic evolutionary processes. Rational pest control strategies must be designed to manage resistance, both to prolong the effectiveness of pesticides and to reduce environmental contamination by excessive use of chemicals. These strategies should be based on Integrated pest management, avoiding exclusive repeated use of insecticides from the same chemical subgroup (indicated by IRAC Mode of Action Group number), alternating products from other IRAC MoA groups and by using insecticide mixtures.

Future thrust: Research on molecular basis of resistance focusing on mechanisms like quantitative resistance, epigenetic changes such as DNA methylation etc. can be explored and development of simple diagnostic kits at the field level to test resistance are need of an hour to solve this issue.

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BLACK TURMERIC

A Wonder Medicinal Herb

Black turmeric (*Curcuma caesia Roxb.*) is an important medicinal plant belonging to the family Zingiberaceae. It is considered as an endangered species by the central forest department of India due to its bio-piracy. *Curcuma caesia* is a perennial herb with bluish-black rhizome.

The rhizomes are of high economical value due to its medicinal properties. The rhizome of black turmeric are found to be useful in treating several disease like piles, leprosy, bronchitis, asthma, cancer, epilepsy, fever, wounds, impotency, fertility, tooth ache vomiting etc.

It is a wonder herb and contains the highest content of curcumin. It is used for treatment of menstrual disorders, piles, impotency and epilepsy. Externally, this plant has been used in the treatment of wounds, white patches on the skin and leprosy sores. It is also known to enhance fertility levels and also used for the treatment of enlargement of the spleen and certain types of tuberculosis. The rhizome as well as the leaves of the plant is used in medical formulations.

Constituents

Black turmeric contains alkaloids, terpenes, amino acids, carbohydrates, tannins, flavones, flavonoids, steroids, reducing sugars, proteins, anthraquinones, glycosides, cardiac glycosides. The volatile rhizomes oil of *Curcuma caesia* contains of components, representing 97.48% of the oil, with camphor (28.30%), ar-turmerone (12.30%),(Z) ocimene (8.2%), 1,8cineole (5.3%), elemene (4.8%), borneol(4.4%), bornylacetate (3.3%) and curcumene (2.82%), ar-curcumene (6.8%) as the major constituents.

MEDICINAL USES

- The rhizomes of the herb are often used for treating pneumonia, cough, and also for treating cold in children and are also used for treating fever and asthma in adults.
- In northeast India, the powder of rhizomes is used as a face-pack. Fresh rhizomes are crushed and applied as a paste on forehead for relief from migraine or applied on the body for sprains and bruises.
- The rhizomes act against leukoderma, epilepsy, cancer and HIV/AIDS. Intake of small amount of rhizome paste is claimed to expel gases from the stomach and cure menstrual disorders.
- The rhizome of the plant is aromatic, contains essential oil and used for a variety of purposes.
- The rhizome of the herb is traditionally used for the treatment of hemorrhoids, leprosy, asthma, fever, wounds, vomiting, anthelmintic, aphrodisiac, gonorrheal discharges and inflammation. Also *Curcuma caesia* rhizome extract had been used as smooth muscle relaxant, anti-tumour and anti-oxidant.
- Fresh rhizome of black turmeric is used in wounds and nagging sores for relief and quick healing. Curcuma caesia provides relief from stomach problems including indigestion. Chewing a small piece of rhizome will provide relief from indigestion or stomach pain.
- It also helps in easy digestion and the proper functioning of the liver and kidneys. Rhizome and leaves of black turmeric is used in different parts of the world. It is used as a tonic for the brain and the heart. Rhizomes are often used for treatment of leucoderma, piles, bronchitis, asthma, tumors, tuberculous glands of the neck, enlargement of the spleen, epileptic.
- Rhizome of *Curcuma caesia* is ground in the form of a paste in rheumatic arthritis. Fresh rhizome decoction is used as antdiarrhoeiaric and to get relief from stomach ache. The fresh rhizome paste of *Curcuma caesia* is applied during the snake bite and scorpion bite.

CONCLUSION:

Black turmeric is an effective modern medicine and also thought out to be safe in comparison to the synthetic chemical medicines.

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Grass pea

An Insurance Crop In Climate Changing Scenario

Lathyrus sativus L. (2n=14) commonly called Grass pea, Khesari, Kalai, Chickling vetch is an annual pulse crop belongs to the family Fabaceae. Grass pea (*Lathyrus sativus L.*) is a Neolithic plant that has survived millennia of cultivation and has spread over the continents. It is still considered as an orphan or underutilized legume as it has received relatively less attention in national or international priorities.Global Crop Diversity Trust (GCDT) project "Adapting Agriculture to Climate Change" in collaboration with ICARDA (International Centre for Agricultural Research in the Dry Areas) considers grass pea as one among the priority crops which improves the subsistence livelihood of marginal farmers (De Boef, Walter et al., 2019). Grass pea is widely distributed in Asia (Bangladesh, China,

India, Nepal and Pakistan), in the Middle East (Iraq, Iran, Afghanistan, Syria and Lebanon), in Northern Africa (Ethiopia, Egypt, Morocco, Algeria and Libya) and Southern Europe (France, Spain and Italy) (Campbell et al., 1997; Dixit et al., 2016). In India, the major grass pea cultivating states are Chhattisgarh, Bihar, Jharkhand, Maharashtra, Odisha, Assam, West Bengal and Eastern Uttar Pradesh. It is grown as a relay crop in the Rice-Based Cropping system, utilizing the available moisture. It is also grown as mixed crop or intercrop during rabi season and sole crop in "Utera" conditions as a rice fallow crop.

Grass pea is a robust leguminous crop and it is considered as one of the resilient crop to climate changes and as a survival food for people in the drought-triggered famines. Grasspea is one crop which can be grown in marginalized land with minimum inputs which tagged it as insurance crop to farmers. The deep and hard penetrating root system of this crop allows the cultivation of grass pea in various types of soil even in marginal lands. As a legume crop it meet out its own nitrogen requirement and also benefits the subsequent grown crops. It can serve a variety of purpose apart from human food as feed and fodder with 18-34% and 17% protein content in seeds and leaves respectively (Rizvi et al., 2016). The seeds are the high-level source of polyunsaturated fatty acids (Grelaet al., 2012) and it is the only known dietary source of aminoacid L- homoarginine benefits in cardiovascular disease treatments and in overcoming the consequences of hypoxia (Singh and Rao 2013). Therefore, as

neutraceutical, grass pea is an excellent source of a potential functional food (Llorent-Martinez et al., 2017).

Nonetheless, in common with other grain legumes, grass pea also contain a variety of anti-nutritional factors (ANFs) in their seeds. However, grass pea seeds contain the neuro-degenerative compound ODAP (b-N-oxalyl, b-diaminopropionic acid), and excessive consumption causes lathyrism, a neurodegenerative disorder in humans. This has resulted in bans imposed on the sale of grass pea as a pulse crop. The crop has, therefore lagged behind cereals and other major pulses in term of the genetic and genomic resource improvements essential for deploying advanced breeding technologies. Nutritionally, grass pea is rich in protein and minerals and provides an excellent and cheap source of protein (28–30%); this suggests promise as an excellent alternative protein source for malnourished populations. Furthermore, the crop is rich in sulfur-containing amino acids, w-3 unsaturated fats, dietary fibre, non-starch polysaccharides, and phytochemicals such as phytosterols, saponins, phytoestrogens, isoflavones and antioxidants (Narasinga Rao 2002). However, overconsumption of the grass pea seeds and a crippling neurological disorder, later coined neurolathyrism, had been linked already by the people in ancient India and Greece. The aggrandizement of their suspected toxic properties has led to disregard the crop's exceptionally positive agronomic properties like their ability to grown in drought prone regions and their dietary advantages. In normal environmental and socio-economic conditions, where grass pea is part of their balanced diet, the existence of neurolathyrism is virtually not there.

Grass pea has the prospects to become a wonder crop if the double stigma on its reputation as a toxic plant that cause a crippling disease to humans and animals if it was consumed and this crop as food of the poor can be disregarded. Supporting to this, recent research findings also has exposed the potential of grass

pea crop as a health-promoting nutraceutical and as a insurance crop for arid and marginal land farmers. Identification of low ODAP germplasm lines and subsequent development of varieties with low ODAP content in seeds may be applicable to strengthen the nutritional value of grass pea without comprising the multiple stress tolerance of this promising crop.

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Teasel gourd

A New Vegetable Cropwith Rich Nutritional Potential For Crop Diversific Ation In Kerala

Crop diversification, is intended to give wider choice in the production of variety of crops in a given area so as to expand production, to improve the nutritional intake and to reduce the risk of crop loss by incorporating new or less exploited/ under-utilized crops to the traditional cropping system. It ensures nutritional security, diversity in food basket, economic viability along with climate resilience. Teasel gourd, also called 'Kantola' or Assam Kakrol (*Momordica subangulata* subsp. renigera(G.Don) de Wilde) is a semi-domesticated vegetable, native to Assam-Myanmar region. In India, it is cultivated commercially in Eastern and North Eastern states mainly Odisha, West Bengal, Assam, Tripura and to a small extent in Andaman Islands.

Bangladesh is the leading producer and exporter.

It is a home garden vegetable in all North Eastern states.Its cultivation needs to be popularized in nontraditional areas like Kerala and adjoining states due to its nutritional richness combined with high consumer acceptability and adaptability to high rainfall humid tropical regions. Fruits are nutritionally very high, rich in vitamins, minerals and essential amino acids. It also contains small quantities of essential nutrients like ascorbic acid, carotene, thiamin, riboflavin, niacin and Selenium. Compared to its close wild relative; *M. diocia*(Erumappaval/spine gourd), it has bigger fruit size of 80-130 g, extended harvest period, efficient vegetative propagation, higher yield and is more amenable to commercial cultivation. Ripe fruit pulp and rind are rich source of β carotene and lycopene. Tender leaves and clippings are excellent vegetables. Sprouts also can be cooked and eaten.

Cultivars/varieties:

Being a semi-domesticated crop, varietal improvement is at its infancy. Nevertheless ICAR-IIHR recommended varieties and cultivars include Arka Gaurav, Arka Neelachal Shanthi (Hybrid), Arka Bharath collection number:JB/11-173 and NBPGR.T. hybrid.1 (IC597084 X IC553771) are good yielders of which the latter one possesses bigger fruit size (110-135 g) and prolific bearing habit.

Propagation: Kantola is a dioecious vine. Both sexual and vegetative mode of reproduction are practiced. Vegetative

Nutritional values (value per 100g) (Bharati et al., 2014)

Proximate nutrient composition of M. subangulata subsp. renigera	
Component	Content
Moisture (%)	89.87
Protein (g)	1.69
Total Fat (g)	1.00
Total sugar(g)	9.17
Starch (g)	8.25
Reducing sugar (g)	5.50

Mineral content of M. subangulata subsp. renigera	
Component	Content
P (%)	0.37
K(%)	2.30
Ca (%)	0.12
Mg (%)	0.10
Fe (ppm)	119.80
Mn (ppm)	33.90
Cu(ppm)	10.80
Zn(ppm)	32.30

propagation protocols have been standardized for facilitating germplasm collection as well as popularization of teasle gourd. For optimum female to male ratio and uniform behavior, use of vegetative propagules are preferred.Sprouted tubers and vine cuttings are the most common method of propagation, however, micro tubers from leaves are also an alternative propagation method.

Sprouted tubers: Tubers have a natural dormancy of 2-3 months after senescence. An average plant produces over 25-30 adventitious tubers of 60-80g on stoloniferous roots. Tuber pieces may be sprouted in portrays before transplanting to fields. Cut tuber pieces should be treated with 2% Dithane M-45 and shade dried before keeping for sprouting.

Vine cuttings: Female plants have prolonged flowering that extends beyond that of male plants resulting in non-availability of pollen source for fruit set of late seasons developed female flowers. In order to ensure continued supply of male flowers, staggered planting of vine cuttings of male plants can be an effective approach. It was found that young midlevel cuttings with three nodes upon treatment with Keradix (rooting powder) for 30 minutes and placing in mist resulted in 53 % regeneration. Terminal cuttings take too much time to root and often they were unable to withstand the

Tubers

Rooting of vine cuttings

stress induced by detaching from the motherplants. Cuttings should be taken from vigorously growing mother plants at early flowering stage and before axillary flower buds emerge. Propagation using mid-level vine cuttings may be adopted as an alternate technology for regeneration of teasel gourd.

Microtubers from leaves: Healthy mature leaves (30 days old) detached along with petiole can be rooted by treating petiole base with rooting hormone (IBA @3000ppm).Spread them in shaded condition for 15 min for the hormones to get absorbed and keep in mist chamber after inserting the treated petiole bases in a medium of river sand. Such leaves produce microtubers after 60-90 days, which sprout and establish as new plants after a short dormancy period (4-6 weeks).

Land preparation and Planting

Kantola can tolerate high rainfall and low sunshine hours prevalent in southern Western Ghats and west coast during South West monsoon season, hence can be an excellent vegetable crop for lean monsoon season. Well drained deep alluvial soils are the best, even though sandy loams and well worked out laterite soils are equally good. A temperature range of 25-34^0 C during the crop period of 5-6 months and high humidity are ideal. Soil pH should be regulated by liming before planting.

Sprouted plantlets maybe planted with the onset of pre-monsoon showers in March-April (extendable to May end) or for an offseason crop under assured irrigation in October-November. Soil should be tilled to a depth of 30 cm and levelled. About 150g lime powder may be sprinkled around each planting pit and allowed to wash down through soil (give an irrigation

Sprouted tubers

after liming or leave aside for10 days/expose to rain for leaching out). Pits of 60 x 60 x 60 cm size may be dug at a spacing of 1.5 x 1.5 m. Pits may be filled with about 5 Kg well rotten Farmyard manure and top soil. About 500 g bone meal may be applied as basal dose along with 250g neemcake. In root knot nematode infested soil, a light burning of the dugout pits with dry leaves is good for control of nematodes. Planting can be done in pots and grow bags also. Containers with a capacity to hold about 10-15 Kg potting mixture are ideal.

Aftercare

Kantola is a fast grower and tuber raised plants comes to flowering within 35-40 days and first harvest can be taken within 52-55 days. Yield can be increased considerably by adopting drip irrigation, fertigation and mulching. It cannot tolerate waterlogging but needs assured water supply for continuous flowering and fruiting. Paddy straw, plated coconut leaves or polythene mulching sheets can be used to prevent weed growth and conserve soil moisture. Foliar spray of fish amino acid @ 3ml/L at weekly intervals will enhance growth and flowering.

Training

Being a weak stemmed tendrillar climber, it needs a pandal or bower system for optimum spread of vines. Dried tree branches or bamboo tops are ideal for grow bag cultivation and home gardens. For convenience of hand pollination pandal breadth should be less than 1.5m and at breast height with walking space between rows. Single line trellies of nylon


Female flower bud and flower


Male flower bud and flower

net and angular iron/ wooden poles extending the whole length of the bed and of 1.5m width and 1.5-1.8m height are ideal for commercial plots.

Pollination management

In the absence of its specific pollinators outside its home range, female flowers needs assured hand pollination for enhanced fruit set. Natural pollination rate outside North East India is between 10- 20%. A few male plants may be raised on staggered dates in a corner of the field and male flowers handpicked and stamens touched/rubbed to the receptive stigmas preferably before noon for assured fruit set.

Surplus pollen may be stored under refrigeration in air tight containers for pollination on next day. In humid wet climate, stigma receptivity extends to 24 hours from anthesis and become receptive 12 hours

before anthesis.

Harvesting and marketing

Yield may vary from place to place depending upon soil fertility and climatic conditions. On an average a healthy vine yields between 10-12 kg (>20kg) tender fruits in a span of 4 months.

Fruits are harvested 10-12 days after pollination, when they are still green and tender. Delayed harvest leads to progressive orange coloration of fruits and hardening of seeds, making it unappealing to consumers. Regular picking of fruits at 3 days interval promotes new flowering and more yield. Harvested tender fruits remain fresh for 2-3 days in moist and shady conditions and up to a week under refrigeration.Tender fruits can be cooked as vegetable according to local preference. It can also be pickled, canned or brined.

Surplus can be sliced and dehydrated or sundried for preparing value added products. Fruits are cooked the same way as bitter gourd replacing it in recipes. Cooked fruit is non bitter and with bitter gourd/ spine gourd like flavour.

Pests and diseases management

In general teasel gourd is not severely affected by many pests or diseases. Nevertheless, the following pest and disease problems were observed sporadically. Pests infesting teasel gourd plants include cucumber moth, fruit flies, spotted/ Epilachna beetle, red pumpkin beetle, jassids, scale insects and Root knot nematodes. Downy mildew, Anthacnose, and Fusarium wilt are the major diseases. Spraying of 5% neem seed kernel extract can effectively control cucumber moth caterpillar. Fruit fly management can be achieved by trapping the adult flies in cuelure pheromone traps. Pheromone traps @ one trap/15 cents should be installed in the pandal once the flowering initiates. Tender fruits may be wrapped in paper bags or polythene bags to prevent egg laying by fruitfly. Drenching the basins with Beauveria bassiana can prevent the emergence of pupae. Organic decoctions like cow urine with bird eye chilli (25g) diluted in 10 L water can effectively manage Spotted beetle. Addition of 50-100 g neem cake in the basin and spraying of 2% neem oil garlic emulsion can control red pumpkin beetles and jassids respectively. Scale insects can be controlled by spraying Imidachloprid 17.8 SL (Confidor) @ 3ml/10 L to the affected stem parts.

For nematode control, application of neem cake (500g), and Paecilomyces lilacinus(10g) per pit as basal application is effective in reducing the severity of the infestation. A second dose of P. lilacinus@ 10g/pit at 40 DAP may be applied. Crop rotation after two years should be followed. Soil application of Pochonia is also effective in reducing soil inoculum. Incorporation of Cartap @ 5-10 g per pit may be done for seed tuber plots.

Spray mancozeb 0.2% or curzate 0.3% or chlorothalonil 0.2% or ridomil (metalaxyl + mancozeb MZ 0.1%) if downy mildew disease severity is high. Anthracnose can be controlled by treating the seed tubers with carbendazim 2g/kg and spraying of mancozeb 2g or carbendazim 0.5g/lit.

Conclusion

Teasel gourd can be a promising nutritious vegetable with high consumer acceptability. Year round cultivation scope, higher yield, less pest and disease problem and amenability to organic/ homestead cultivation makes it a potential crop for enhancing farm income also.

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Diagnostic Characters Of Thrips Infesting Agricultural Crops

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Fig. 1: Frankliniella schultzei

Thrips of the suborder Terebrantia are minute insects (0.5 to 1.2 mm) and are capable of multiplying at a faster rate both sexually and parthenogenetically. Thrips are well distributed worldwide in temperate and tropical zones, but they are more diverse in the warm tropical areas than in the colder regions. They are rarely noticeable due to their small size. The adults have four slender wings fringed with long marginal cilia and asymmetrical mouth parts. The life cycle is in between holometabolous and hemimetabolous insects; the feeding immature ones are larvae, and all species have more than one pupal stadium. Terebrantian thrips are pests of

Figs 2–4: Damage symptoms on flowers (Source-Sandeep singh and Rachana, 2020)

Fig. 5: Retithrips syriacus

Figs 6–8: Damage symptoms on pomegranate (Source-Sandeep singh and Rachana, 2020)

food crops and ornamentals due to the damage caused by feeding and as vectors of Tospoviruses, which decrease the yield and market value. They are successful pests due to their life history features, concealed lifestyle and polyphagous nature.

Species identification and its significance

Identification of insect pests has been a challenging task over centuries. The accurate species identification is the primary and fundamental step to develop genetic and other biological data that is needed for effective management strategies. Reliable identification is also essential for the early detection of vectors. The misidentification of an economically significant species may have parallel and serious consequences as it will generate perplexing data for other fields of biology. Hence, diagnostic characters of a few pest thrips species are recorded to help researchers and students for easy identification.

Common blossom thrips: *Frankliniella schultzei* (Trybom) (Figs 1–4)

Diagnosis: Body yellow with or without brown shading on abdominal tergites. Antennae 8 segmented. Head with ocellar setae 3 pairs, pair III arising closely between anterior margins of posterior ocelli and almost as long as side of ocellar triangle; postocular setae pair IV as long as distance between posterior ocelli. Pronotum having 5 pairs of major setae; anteromarginal setae shorter than anteroangulars, a pair of minor setae present medially between posteromarginal submedian setae. Metanotum with median setae at anterior margin without campaniform sensilla. Forewing first and second veins with complete rows of setae. Abdominal tergite VIII without posteromarginal comb. Abdominal sternites III–VII

without discal setae.

Host plant: Polyphagous Jatropha thrips: *Retithrips syriacus* (Mayet) (Figs 5–8)

Diagnosis: Body blackish brown with polygonal reticulations; forewing grey. Antennae 8 segmented. Forewing with longitudinal veins free from ambient vein; apical half with 3 calluses between the costal and anterior veins; anterior margin without fringe cilia; wing apex strongly rounded. Abdominal tergites reticulate fully; I with constricted posterior submedian areas, II–X with strongly reticulate median depressed area with wrinkles, III–VII each with a sub median pair of toothed comb on hind margin, VIII with complete comb of long microtrichia.

Host plants: Castor, Cotton, Grapes, Jatropha, Pomegranate, Rose

Grapevine thrips: *Rhipiphorothrips cruentatus* Hood (Figs 9–14)

Diagnosis: Body dark brown; forewing with yellowish brown base, clavus brown; legs yellow.

Fig. 9: Rhipiphorothrips cruentatus

Figs 10–11: Damage symptoms on grapes (Source-Sandeep singh and Rachana, 2020)

Figs 12–14: Damage symptoms on guava and jamun (Source-Sandeep singh and Rachana, 2020)

Sciothrips cardamomi

Scirtothrips bispinosus

Scirtothrips dorsalis

Head strongly rugose, minute setae, posterior dorsum appear like a wide collar area; antennae 8 segmented. Pronotum rugose, major setae absent; mesonotum completely divided medially; metanotal triangle extends to half of metascutellum. Forewing anterior margin without setae and fringe cilia, veins weak, veinal setae minute. Abdominal tergite I reticulated, II–VII sculptured laterally, smooth median area, comb of trichoid teeth on median of antecostal ridge, VII–VIII with a pair of stout posteromedian setae, posteromedian of IX–X with a pair of expanded setae.

Figs 18–21: Damage symptoms on citrus, mango and pear (Source-Sandeep singh and Rachana, 2020)

Host plants: Cashew, Castor, Grapes, Guava, Jamun, Jatropha, Pomegrante, Rose

Stenchaetothrips biformis

Thrips tabaci

Cardamom thrips: *Sciothrips cardamomi* (Ramakrishna) (Fig. 15)

Diagnosis: Body brown. Antennae 8 segmented. Pronotum with 2 posteromarginal setae pairs. Metanotum with median faint sculpture but reticulate basally; median setae pair far behind anterior margin; without companiform sensilla. Forewing first vein with broadly interrupted setae beyond basal third; second vein with 5 setae, placed apart. Abdominal tergites I–VII with lateral triangular pointed teeth along posterior margin; II with 3 lateral marginal setae; VIII with a complete posteromarginal comb. Intermediate abdominal sternites with lateral dentate microtrichia along posterior margin.

Host plant: Cardamom

Tea thrips: *Scirtothrips bispinosus* (Bagnall) (Fig. 16)

Diagnosis: Body brown; forewing uniformly shaded. Head with ocellar setae pair III arise between posterior ocelli. Pronotum with transverse striations, posteromarginal setae S2 longer than S1. Metanotal sculpture reticulate; median pair of setae behind anterior margin. Forewing first vein with 7 setae; second vein with 1 seta. Hind tibia with a long, strong spine much anterior to posterior margin. Abdominal tergites II–VIII with dark antecostal ridge; tergal microtrichial fields with 3 discal setae in transverse line; VIII with complete posteromarginal comb; X with 2 pairs of stout setae. Abdominal sternites with microtrichial fields laterally; II–VII bear 3 pairs of posteromarginal setae.

Host plant: Tea

***Chilli thrips:* Scirtothrips dorsalis Hood (Figs 17–21)**

Diagnosis: Body yellow, median brown marking on abdominal tergites III–VII, forewing shaded. Antennae 8 segmented. Head with ocellar setae pair III between posterior ocelli; 2 pairs of post-ocellar setae. Pronotum with posteromarginal setae S2 longer than S1. Metanotal sculpture generally transversely

Thrips palmi

arcuate anteriorly, with irregular longitudinal reticulations or striations posteriorly; median pair of setae behind anterior margin. Forewing second vein with 2 setae. Abdominal tergal microtrichial fields with 3 discal setae; VIII with posteromarginal comb complete; IX with discal microtrichia posteromedially. Abdominal sternites with microtrichia extending across median area on posterior half.

Host plants: Polyphagous

Rice thrips: *Stenchaetothrips biformis* (Bagnall) (Fig. 22)

Diagnosis: Body brown; fore wing pale brown. Antennae 7 segmented. Head with 2 ocellar setae pairs, pair III shorter than II, arising a little anterior to hind ocelli; postocular setae pair II as long as distance between hind ocelli. Pronotum having 2 pairs of long posteroangular setae; 2–3 pairs of posteromarginal setae. Metanotum with longitudinal striations, converging posteromedially; campaniform sensilla not present, median setae arise behind anterior margin. Fore wing first vein with 2–4 distal setae; second vein with about 12 setae, uniformly spaced. Abdominal tergites with median setae small, wide apart; VIII with complete posteromarginal comb with irregular microtrichia. Abdominal sternites with irregular, small dentate microtrichia on posterior margins.

Host plant: Rice

Melon thrips: *Thrips palmi* Karny (Fig. 23)

Diagnosis: Body yellow; forewing pale. Head with small ocellar setae pair III, arising outside ocellar triangle; postocular setae pair I slightly longer than ocellar setae III. Antennae 7 segmented. Pronotum with 2 pairs of very long posteroangular setae, 3 pairs of posteromarginal setae. Metanotum with irregular longitudinal lines converging to posterior margin, with anteriorly curving transverse lines; median setae arising well behind anterior margin, campaniform sensilla present. Forewing first vein with 3 distal setae. Abdominal tergite II with 4 marginal setae laterally; VIII with complete comb; discal setae on pleurotergites absent. Abdominal sternites without discal setae. It is almost similar in structure to Thrips flavus Schrank, but the latter has ocellar setae pair III closely placed together behind the first ocellus within the ocellar triangle.

Host plant: Polyphagous

Onion thrips: *Thrips tabaci Lindeman* (Fig. 24)

Diagnosis: Body yellow or brown. Antennae 7 segmented. Head with small ocellar setae III, arise on anterior margins or just within ocellar triangle; post ocular setae I–III equal to ocellar setae III in length. Pronotum with 3 or 4 pairs of posteromarginl setae.

Metanotum irregularly reticulate medially with lines converging to midpoint near posterior margin; median setae short, arise behind anterior margin; campaniform sensilla absent. Fore wing first vein usually with 4 (varying from 2–6) distal setae. Abdominal tergite II with 3 lateral marginal setae; VIII with complete posteromarginal comb of long slender microtrichia; pleurotergites without discal setae, sculpture bearing rows of fine microtrichia. Abdominal sternites without discal setae.

Host plants: Cotton, Onion, Garlic

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Economic and medicinal value of Pongamia pinnata

Pongamia pinnata(L.) Pierre [Family: (Fabaceae)] is a medium sized glabrous tree popularly known as Karanja in Hindi, Indian beech in English and Pongam in Tamil. It is adaptable tree for tropical and sub-tropical regions which requires excellent drainage and a sunny location. The tree is known for its multipurpose benefits and as a potential source of biodiesel. It grows easily from seed. The seeds contain on an average about 28-34% oil with high percentage of polyunsaturated fatty acids. It also contains several phytoconstituents such as alkaloids, tannins, steroids, glycosides, demethoxy - kanugin, glabrin, kanugin, karangin, flavonoids and fixed oils.

Pongamia pinnata is a preferred species for controlling soil erosion and binding sand dunes because of its dense network of lateral roots. Root, bark, leaves, flower and seeds of this plant have medicinal properties and traditionally used as medicinal plants. All part of plant have been used as a crude drug for the treatment of tumours, piles, skin diseases, itches, painful rheumatic joints wounds, ulcers, diarrhoea etc. It is well known for its application

Economic and Medicinal value of different parts of the Pongam plant

Plant parts	Economic Value	Medicinal Value
 Root	Root is used as fish poison	• Juice of roots with coconut milk and lime water used for treatment of gonorrhea. • Used for cleaning gums, teeth and ulcers. • Roots are bitter anti-helmintic.
 Stem	• Used for stove top fuels, poles and ornamental carvings. • Ash of wood used for dyeing. • Cabinet making, cart wheels, posts • Agricultural implements, tool handles and combs.	• Aqueous extracts of stem bark exhibit significant CNS sedative and antipyretic activity.
 Bark	• String and rope can be made from the bark fiber. • Used for paper pulp.	• For bleeding piles, for beriberi, reduce swelling of the spleen. • Useful in mental disorder, cough and cold.
	• Used as cattle fodder. • Used in stored grains to repel insects. • Used as manure for rice and sugarcane fields	• Juice of leaves is used for cold, cough, diarrhoea, dyspepsia, flatulence, gonorrhea, leprosy. • Leaves are anti-helminthitic, digestive and laxative used for inflammations, piles and wounds. • As an infusion to relieve rheumatism. • As an extract to treat itches and herpes.
 Flower	• Good sources of pollen for honey bees. • Flowers are edible	• Useful to quench dipsia in diabetes, for alleviating vata and kapha and for bleeding piles.

Plant parts	Economic Value	Medicinal Value
 Fruit	Fruits are edible.	• Fruits used for abdominal tumors. • Useful in ailments of female genital tract, leprosy, tumour, piles, ulcers and upward moving of the wind in the abdomen.
 Fruit	• After oil extraction has been used as "green manure" as it is rich in protein and nitrogen. • Used as insecticides	• Used for keloid tumors. • Used in hypertension, skin ailments and rheumatic. • Seed powder valued as a febrifuge, tonic and in bronchitis and whooping cough. • Useful in inflammations, pectoral diseases, chronic fevers, haemerrhoids and anemia.
 Oil	• Used as fuel for cooking and lamps, as a lubricant, water-paint binder, pesticide and in soap-making, candles and tanning industries. • Used as lipids for commercial processes. • Used in cosmetics.	• Oil is styptic, anthelmintic, and good in leprosy, piles, ulcers, chronic fever and in liver pain. • Useful in rheumatism arthritis,scabies, whooping cough. • Mixture of oil and zinc oxide used for eczema.

as animal fodder, green manure, timber and fish poison. It has also been recognized to possess applications in the field of environment and agricultural management.

In the traditional system of medicines, such as Ayurveda and Unani, the *Pongamia pinnata* plant is used for anti-inflammatory, anti-plasmodial, anti-nonciceptive, anti-hyperglycamic, anti-lipidperoxidative, anti-diarrhoeal, anti-ulcer, anti-hyperammonic and antioxidant activity.

Pongamia as a Source of Biodiesel

The oil can be used for the production of biodiesel because of its favourable physiochemical properties. It has no poly aromatic compound reduced toxic smoke and soot emission

Uses

Soil Improver

Incorporation of leaves and the presscake into soils improves fertility. Decomposed flowers are valued in the tropics as rich nutrition for special plants, especially when grown in greenhouse.

Nitrogen Fixing

In nurseries and fields the presence of nodules on uninoculated pongam seedlings

is common. It nodulates and fixes atmospheric nitrogen with Rhizobium of the cowpea group.

Ornamental

Pongamia pinnata is often planted in homesteads as an ornamental tree and in avenue plantings, roadsides, stream and canal banks. However the large amounts of flowers, leaves and pods that it regularly sheds make it not very suitable for this purpose.

Shade or Shelter

Grass grows normally beneath the tree so it has been planted for shade in pastures. *Pongamia pinnata* is grown as a windbreak for tea plantation in Sri Lanka.

Erosion Control

A preferred species for controlling soil erosion and binding sand dunes because of its extensive network of lateral roots.

Reclamation

Because it tolerates moderate levels of salinity, pongam is an ideal candidate for recovering a variety of wastelands such as saline soil reclamation.

It is also used in reforestation of marginal lands.

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BEE VENOM Therapy

Use, because you have Very little to lose...!!

The use of honey bee products for healing and health (known as Apitherapy) has been in use since ancient times, however, the most attention grabbing apitherapy treatment today tends to be the use of bee stings to reduce disease symptoms. The use of bee venom therapy (BVT) for rheumatic diseases has been recognized for at least 2500 years. The majority of therapeutically applied bee venom is through injection in the form of desensitization shots for people suffering from hyper-allergic reactions to honey bee venom (anaphylaxis). While bee venom injections are not yet approved by the medical establishment for use treating rheumatic diseases, the sting from the live bee is often used and found helpful for this purpose. Treatment typically consists of applications of bee stings three times a week, about every other day.

Bee Venom Collection

Beekeepers collect and purify the venom. One way this is done is with a frame embedded with wires that are hooked up to a battery. Under the wire grid is a plastic sheet covered with a rubber membrane. The venom collector is placed up against the entrance to a hive and the hive is kicked in order to elicit a defensive response. When the bees come out, land on the collector and touch any

two wires, they get a hot foot and sting the rubber membrane beneath the wires depositing their venom beneath the rubber. The venom that is collected is then dried, filtered and purified in an autoclave before being shipped.

Choosing the sting site

Pressing firmly along the joints and bones looking for spots that are sensitive and painful when pressed. These are called "hot spots" Interestingly, these "hot spots" often coincide with the body's meridians—the places that acupuncturists insert their needles. Stings applied to these meridian points give greater results than when applied in other areas. Some even hypothesize that the honey bee was the first acupuncture needle ever used.

Applying Stings

To help reduce the initial pain of the sting, extreme cold is applied to the ink mark area through the application of ice wrapped in a damp cloth or an ice-pack. The ice is applied for a minute or two in order to numb the sting site and reduce the initial pain associated with the sting.

Once the area is adequately numbed with ice, a bee is removed from the jar and the tip of the bee's abdomen is applied to the ink mark. Eight to 12 inch forceps are the perfect tool for removing bees from the jar. It is important to try and grasp the bees by their head or thorax rather than the abdomen, since grabbing the bee by the abdomen may damage the stinging apparatus preventing the stinging mechanism from working.

How BVT Works

The primary purpose of BVT is to stimulate the body's immune system so that it can begin to heal itself. Once the stinger is imbedded in the skin, it pumps venom into the sting site. In reaction to the foreign substance entering its system, the body sends large amounts of blood to the area. This concentrates the healing properties within the blood around the sting site. In order to receive a full dose of venom, the stinger is left in the skin for at least 10-15 minutes. During this time the stinger is acting as an acupuncture needle. Body's adrenal glands are stimulated by venom to release cortisol. Cortisol is the natural version of the steroid, Cortisone that is commonly used by physicians to treat arthritis and other cases of inflammation. While it is close, Cortisone is chemically not exactly the same as the Cortisol that the body produces and over time patients can develop liver toxicity from Cortisone treatment. It is believed that the body requires various B vitamins and vitamin C in order to produce Cortisol. Thus, it is recommended that for best results, people obtaining bee stings for therapeutic reasons take 1,000 to 2,000 milligrams of vitamin C and a tablet containing multiple B vitamins about one hour prior to receiving BVT.

Rheumatic Disease

While no medical treatment works on everyone 100 percent of the time, scientists suggest that, most forms of rheumatic disease seem to respond to BVT including gout, osteoarthritis, bursitis, tendinitis, fibromyalgia, lupus, and scleroderma. However, the use of BVT for treatment of rheumatoid arthritis is the area most widely documented (Honget al, 2005). BVT has been associated with

increased fertility in sterile women and curing miscarriages. Additional conditions that have been successfully treated with bee venom include; multiple sclerosis, post herpetic neuralgia (shingles), chronic pain syndromes, eczema, psoriasis, sclerosis, corns, warts Epstein Barr virus (EBV), Lyme Disease, mononucleosis, premenstrual syndrome, menstrual cramps, irregular periods, mood swings, depression, and hypoglycaemia.

Side Effects

As with any treatment, there are side effects that can be expected from BVT treatment. While not everyone will experience all of the possible side effects, the most common side effects include the initial pain of the sting, as well as swelling, redness, itching, soreness and tenderness, feelings of heat in the treatment area, and in extreme cases nausea and fever. It is important to note that none of these localized reactions are typically life threatening.

The public's usual response to a sting reaction is to take an antihistamine. The problem with taking antihistamines for uncomfortable reactions to BVT is that they suppress the body's immune system. Since BVT is practiced in order to stimulate the body's immune response, drugs that depress the body's immune system are contraindicated. It is preferable therefore to use the homeopathic remedy,since the remedy can reduce symptoms without suppressing the immune system. Similarly, one should avoid the use of alcohol during bee venom therapy, since alcohol also suppresses the body's immune system.

Although it is extremely rare, about one percent of the population is hyper-allergic to honey bee venom and will experience anaphylaxis. For this reason, it is prudent to always have an epinephrine injector (brand name: EpiPen) on hand when giving or receiving BVT and always apply a test sting first if the person has not been stung within the past two weeks.

For over 100 years honey bee venom has demonstrated its efficacy in thousands of cases and the hundreds of papers written and published in the U.S., Europe and other countries. Charles Mraz believed that this provides a solid foundation on which to build an exciting new field of immunotherapy medicine.

In this regard the main objective of this article is to disseminate the information and to help those who need it. Also, to extend the bee rearing as a profitable venture to add extra penny to the farmers.

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