REFERENCE NO: **STSH21102/237**

# A COMPARATIVE STUDY ON THE EFFECTIVENESS OF PESTICIDAL ACTION OF SAMBUCUS NIGRA AND BOMBYX PROCESSIONEA AGAINST LEUCINODES ORBONALIS IN SOLANUM MELONGENA

## 1. INTRODUCTION:

Agriculture is the largest source of livelihood in India. Even today 70% of the rural households depend primarily on agriculture for their income, with 82% of farmers being small and marginal [1]. In Tamilnadu agriculture continues to be the prime sector of the State economy, around 60 percent of the population is being involved in agriculture. The government has formulated many policies and objectives to ensure stability in agricultural production and to increase the agricultural production in a sustainable manner to meet the food requirement of growing population and also to meet the raw material need of agro based industries thereby providing employment opportunities to the rural population [2].Solanum melongena commonly known as eggplant also known as brinjal. It is highly cosmopolitan and is considered as the poor man's crop thereby grown in almost all parts of India except higher altitude. 50 local types of brinjal can be collected from several districts of Tamil Nadu. It contains high amount of carbohydrate (6.4%), phosphorus (0.02%) iron (0.0013%), and other mineral material matters [3].

Leucinodesorbonalis is a destructive pest of brinjal, which commonly affects the yield in South and Southeast Asia. It causes an average yield loss of about 31.61 percent in winter and 73.59 percent during summer seasons [4].Leucinodes orbonalis is a moth species .It is also known as brinjal fruit and shoot borer. It has a huge economic impact on brinjal production [5]. . In India the incidence of the pest occurs as an outbreak every year or sporadically. The pest becomes more destructive in its vegetative and reproductive stage [6]. It lays the eggs on the under surface of leaves, flower bud or calyx, stem. After hatching the larva makes its way into the fruits and shoot and blocks the entrance hole with its waste matter. As a result, leaves fall of and the plant, the growth is hampered and therefore the aesthetic value of plant is destroyed [7].

Agro homeopathy will lend a helping hand by improving the plants development process in better way. Agrohomoeopathy was first mentioned almost 200 years ago in the writings of

Boenninghausen. He noted that the excess or leftover remedies he threw into his plant pots were having an effect on the plants, but he never took the research further. Charles Darwin, after his cure with homoeopathy, wrote that potentised remedies had a good action on plants. In the late 19th and early 20th centuries both Rudolph Steiner and Lilly Kolisko experimented with various substances on plants [8]. Agrohomoeopathy is better than organic or biodynamic farming. It is the most chemical free, low cost, non-toxic method of growing food and other crops which is alternate to chemical pesticides. Agro homoeopathy makes the plants resistant to disease and pests by strengthening them from the inside out [9]. On account of this ruinous pest farmers tend to use 10 to 30 sprays per season due to which they may face a load of financial burdens. Overuse of these pesticides also increases the risk of health hazards of the consumers. In these type of crisis Homoeopathy can be implemented safely in order to take the edge off these pesticides and also promotes the growth of healthy plants. Repertorizing after considering all the symptoms manifested, Sambucus nigra and Bombyx processionea are found to share close similarities with the symptoms produced. Both these remedies are indicated as 5-markremedies [10]. In Sambucus nigra, the leaves have an unpleasant smell which repels insects and for this reason gardeners use this drug against caterpillars [11]. Bombyx processionea is the tincture obtained from a live caterpillar [12]. In 'Homoeopathy for farm and garden', the writer Vaikunthanath Das Kaviraj states that Sambucus is indicated for treating the plants of Solanaceae[13].Thus both the farmers and the consumers will be benefited by a safe and cost effective intervention.

## 2. REVIEW OF LITERATURE:

### 2.1.1. Solanum melongena L:

*Solanum melongena* is an erect annual herb with simple, ovate, chartaceous leaves; white to mauve or purple, stellate flowers and its fruits are globular to ovoid, glabrous, usually white or maroon at maturity [14]. The chemical constituents of eggplant (Solanum melongena L.) mainly contain flavonoids, multiple alkaloids (including amides and glycoalkaloids), phenolic acids, and steroids. Among them, amides and phenolic acids are typically regarded as the primary and essential chemical components in eggplant [15]. The fruit should not be eaten raw. The dried and powdered fruit is used as an ingredient in commercial cosmetic preparations for oral care [16].

### 2.1.2. Classification:

Kingdom : Plantae

Phylum : Spermatophyta

Class : Magnoliopsida

Order :Solanales

Family : Solanaceae

Genus : Solanum

Species : Solanum melongena.L[17]

### 2.1.3. Common types grown in India:

Pusa Purple Long

Pusa Purple Cluster

Pusa Purple Round

Azad Kranti

Arka Shirish

Arka Kusumkar

Arka Nidhi

Pusa Barsati

Pusa Uttam [18]

### 2.1.4. Family:

Solanaceae, commonly known as the nightshade or potato family of flowering plants, it includes 102 genera and around 2,500 species. Most of the plants in the family serves as food and drugs. The commercially important members are Solanum tuberosum (potato) ; *S.melongena* (eggplant); *S. lycopersicum*(tomato) ;various Capsicum species (peppers); Nicotiana tabacum and N. rustica (tobacco) [19];Plants of this family are herbs, shurbs and rarely trees; leaves alternate, flowers solitary or in cymes with a branched tap root system [20].

### 2.1.5. Fruit:

The fruit is a multilocular berry. Weight of a fruit in technical ripeness 0.4-1 kg grows up to 40 cm long and 20 cm wide [21]. It may be egg-shaped (with the pointed end at the base or

apex), elongated or round to approximately round. The fruit has a smooth, glossy skin [22]. Eggplant is low in calories and fats and contains mostly water. It also has some protein, fiber, and carbohydrate. Vitamins like B1, B2, B6, C, K, thiamine, niacin, and pantothenic acid and minerals like magnesium, potassium, manganese, and copper are present in abundance [23].

### 2.1.6. Sex types of eggplant:

Eggplant is an autogamous species, with a strong tendency to cross pollination [24].

### 2.1.7. Flowering and pollination:

Flowers are actinomorphic, complete, Hermaphrodite. It has a persistent type of five lobed calyxes. Stamen five in numbers free and is attached to the throat of corolla. The common feature is Heterostyly [25]. There are four types of flowers depending on the length of the style viz:

1. Long styled.
2. Medium styled.
3. Pseudo styled.
4. True short styled [26].

Heterostyly in brinjal determines and facilitates self or cross-pollination and subsequent fruit set. Long styled flowers (the stigma is above the stamen) or medium styled flowers (stigma is on the same level as the stamen) are always more appreciable in the number than pseudo and short-styled flowers (the stigma is below the stamen). Pseudo and short-styled flowers fail to set fruits, whereas long and medium-styled flowers produce fruits, but short-styled flowers are not totally sterile [27].

### 2.1.8. Temperature:

Ideal temperature for growth of eggplant is between 70° and 85°F (21° and 30°C). The plants show hindered growth during cold weather. Temperatures between 70° to 90°F (21° to 32°C) seem to have good rate of seed germination. A plant receiving direct sunlight for 6-8 hr shows good results. Factors like Cool nights (below 55°F/13°C) or hot days (above 95°F/35°C) can enhance fruiting [28].

### 2.1.9. Soil:

Eggplant can grow in different soil but well drained, fertile, loam soil suits it the best. The soil should have a PH 5.5 to 7.2 [29]

## 2.2. DISEASES COMMONLY AFFECTING THE SOLANUM MELONGENA:

Common eggplant affections are bacterial, fungal and viral in origin. This may involve in fruiting Producing inedible fruits and also cause damages to other parts of the eggplant.

### A.Insect/pest of brinjal:[30]

- Brinjal fruit and shoot borer (LeucinodesOrbonalis):

  It is the most destructive pest of eggplant. The insect affects the seedlings and it's affections continues till the fruit harvest. In young plants, appearance of wrinkled drooping shoots is the classical symptom of damage by this pest which further withers and die away. Later, the caterpillars bore into flower buds and fruits, they have no visible sign of affection but the caterpillars feed inside. The damaged fruit presents with circular existing hole whereas the flower buds tend to fall off without blooming. Affected fruits, becomes unfit for human consumption and so they lose their market value considerably.

- Brinjal Fruit Borer(Helicoverpaarmigera):

  The pest is capable of feeding on different kinds of food. The matured larvae are greenish with dark broken grey lines along the side of body. They grow about 35-45 mm in length. The moth is large having V-shaped speck and are brown with dull black border on the hind wings. At first they feed on leaves and fruiting bodies and then finally bore into the fruit and feed all its contents.

- Brinjal Stem Borer ( Euzopheraperticella):

  Fully grown caterpillars are creamy white with a few bristly hairs over their body. It grows to a length of about 20-22 mm. The moth is small with light straw yellow fore wings and whitish hind wings. The moth measures to a length of about 32 mm along the spread wings. Usually it affects the later stage of crops. The caterpillar feed exclusively in the main stem and enters the main stem by making tunnel which results either in stunted growth or withering of plants.

**B. Fungal diseases:** [30]

- Altemaria Blight (Alternaria spp.):

  Produces spots with concentric rings on leaves and the infected leaves may drop off. Infected fruits turn yellow and fall off prematurely.

- Late Blight (Phythophthora spp.):

  Initially small water soaked lesions appears on the fruit later it enlarges in size and the skin of infected fruit turn brown with development of whit cottony growth.

- Phomopsis Wilt (Phomopsis vexan):

  Most commonly affects leaves and the fruits. Small circular spots appear on affected leaves which later become grey to brown with irregular blackish margins. Dark brown lesions appear on stem and branches and pale sunken spots on fruits which later merge to form rotten areas.

**C.Bacterial diseases of brinjal:** [30]

Bacterial Wilt (Pseudomonas solanacearum): The qualitative symptoms include wilting of the leaves followed by collapse of the whole plant. The wilting is characterized by dropping and slight yellowing of leaves and vascular discoloration. When the cut stem of infected plant is dipped in water a milky white stream of bacteria oozes out proves diagnostic to bacterial wilt.

**D.Mycoplasmal diseases of brinjal:**[30]

Little Leaf of Brinjal (Phytoplasma): A serious viral disease of brinjal, transmitted by Hishimonusphycitis and Amrascabiguttulabiguttula. The infectedleaves show a reduction in size and are malformed into tiny chloroticstructure. The flower buds take an upright position instead of being pendulous. All the flowers become phylloid, leaves become smaller. In severe cases, excessive crowding of short branches and production of smaller leaves give plant a rosette appearance. The infected plants generally do not bear any fruit or either the fruit becomes hard and tough.

**2.3. Fertilizers:**

Eggplant requires a balanced amount of NPK for its growth and yield. Balanced NPK fertilizer (10-10-10) is usually recommended for eggplant. Nitrogen helps the plant for green

growth. Phosphorus has its role in formation of new roots, flowers, fruits and seed production. Potassium strengthens the stem and increases disease resistance and growth of the plant. High amount of nitrogen feed results in large leafy plants with no fruit production [31].

**Disadvantage of chemical fertilizer on other living creatures:**

NPK in large quantities can kill the balance of nature in various ways. When mixed with water, it enhances the excessive growth of plankton and other aquatic plants. When they die, the process of decomposition eats up oxygen that fish and other Aquatic animals need to survive. This upsets the ecosystem of the area and the local fishing industries. Nitrogen in the water can persist for many years. Using more nitrogen fertilizers beyond the plants saturation level plays a significant role.

### 2.3.1. Pesticides:

Pests can reduce the overall yield and possibly kill the plant itself [32]. Commonly used pesticides for eggplant affection are Malathion and Prevathon. Other pesticides used are profenofos, triazophos, chlorpyrifos and cypermethrin.This produces harmful effects by leaving it's residue in soil, water and the fruit. Farmworkers experience skin itching, redness of eyes, muscle pain, headache when exposed to these pesticides [33].

## 2.4. ABOUT MEDICINES

### A.Indication of Sambucus nigra:

The tincture is prepared from fresh leaves and flowers of elder. The leaves of Sambucus have an unpleasant odour when bruised, which is offensive to most insects, and a decoction of these leaves is sometimes used by gardeners to keep caterpillars from delicate plants [34]. One of the chief note of this remedy is edema, dropsical swelling on various parts.

- Can be used for insect attacked on Solanaceae family plants.
- It has an ability to cure rots very soon.
- General insect repellent, particularly against caterpillars, Bud worm, army worm, Sawflies, Diamondback moth, Web worm, cut worm, Potato moth, Cluster caterpillars, Spitfire, Fly strike and rot in sheep,Aphids [34].

- To prevent deleterious consequences from flies.
- Oedematous swellings, especially in twigs, stem and leave. The capillaries do not give passage to sap, and water logging results in these places [35].

**B. Indication of Bombyx processionea:**

Tincture of the Bombyx processionea is prepared from live caterpillars and is used for bad effects from contact with caterpillar in plants. It can be given for bad effects caused by caterpillars.

- This medicine was used to deter caterpillars.
- Bombyx in potentized form is effective to treat most caterpillars on most crops as a generic remedy.
- Can be applied as a spray and in the trickle system. In both cases the plants become immune to caterpillar infestations.
- It is clinically used as a pesticide in cases of caterpillars, vegetable loopers, sawfly larvae, army worms, cabbage moths and other caterpillars [34].
- Cures the scraped skin of the plant or fruit produced by the pest [35].

## 2.5. OTHER RELATED STUDIES

### 2.5.1. ABOUT MEDICINE:

**A. SAMBUCUS NIGRA**

- The study was conducted on cabbage plants to know about the pesticidal property of Sambucus extract. Study duration is 2008-2009. Species of pest included were Phyllotreta spp., Plutellaxylostella, Pierisrapae, Pierisbrassicae, Mamestrabrassicae.The cabbages are sprayed with Sambucus extract. The plants sprayed with Sambucus nigra showed a good resistance against the entire pest included in study. In 2008 a reduction in pest number by 53.9% and in 2009 a reduction of 78% is seen. Hence the study confirms the power of Sambucus extract in increasing plant resistance against pest [36].

- Effectiveness of Homoeopathic Medicine in Fruit Rot of Strawberry Caused by Alternaria Alternata when used along with mancozeb has been studied in this research.

The homoeopathic medicine Sambucus nigra in 30potency individually used, mancozeb individually used and also Sambucus as a mixture with mancozeb. As a result, the percentage control efficiency shown by Sambucus nigra 30 individually is 33.34%, efficiency shown by Sambucus and mancozeb mixture is 57.78%. When mancozeb individually used has shown a value of 41.12%. The study proves than it is more effective when macozeb and Sambucus nigra 30 were used in mixtures in treatment of Alternaria Alternata[37].

- Usefulness of Sambucus nigra solely and when used as mixture along with fludioxonil in reducing fruit rot of pear caused by Penicillium expansum. Sambucus brought about a percentage control efficiency of 39.58%, in case of fludioxonil it is 52.50 and the mixture of Sambucus and fludioxonil generated a percentage control efficiency of 52.52%. Hence it proves that the mixture of Sambucus and fludioxonil can be successfully applied in treatment against Penicillium expansum that causes fruit rot in pear [38].

**B. BOMBYX PROCESSIONEA:**

- This study was done to understand the effect of Bombyx processiona 6X on Rosa rubiginosa in developing resistance against small green grubs which usually feeds on rose bud. The medicine was applied by spraying method. After a series of medicine application there was no grubs seen feeding on rose buds. Thus the study proved the efficiency of producing a resistance to the pest attack [39].

- The study was done to assess the eminence of Bombyx processionea 6x in treating winter moth attack in cherry trees. The study began at June 8, 2010.10ml of medicine was mixed with 10litre of water; this was used on the plant. Then by June 12, 2010 new leaves started appearing on tip, no new infestations are noted. By June 27, 2010 the plant had a new shoot with no affection of the pest [39].

- Efficiency of Bombyx processionea 6X on treating Oak Processionary Moth affecting Oak tree was the study theme. In a land of around 100 Oak trees 10 were selected for the

study. In a proportion of 10ml medicine in 10 liters' water, 2 watering cans per tree on root area is used. After a week the caterpillars begins to avoid trees watered with medicinal solution. Two weeks from the start of study the caterpillars which were present on the tree climbed down the medicinally treated trees whereas the other trees which are not treated still had caterpillars feeding on them [39].

**2.5.2. <u>ABOUT PEST(leucinodesorbonalis):</u>**

- The study was carried out to determine efficacy of botanical plant extracts against fruit and shoot borer (Leucinodesorbonalis). An area of 500 m2 was used to sow eggplant seeds. Biological extracts from Fruit of Hot Chilli, rhizomes of Curcuma longa, damage by several insects and diseases that attack leaves/flower of Lantana camara and leaves of cubeba seriboa are used.The extract was diluted with water and was sprayed with a backpack knapsack sprayer. As a result, the percentage of protection was high with hot chilli 93.73%. The same was observed with Lantana camara which shows 87.32%, Cubeba seriboa 81.32% and Curcuma longa 75.5%. Percentage of damage reduction was high with Cubeba seriboa (53.87%) and Curcuma longa (51.56%). The same observation with Lantanacamara (46.24%) and Capsicum sp. (30. 51%).The study indicated that the botanical products were effective in reducing the degree of damage of fruit and shoot infestation by leucinode[40].

- This experiment was an effort made to reduce the affection of leucinodeorbonalis in eggplant during rainy season. Rainy season is the favourable time for the leucinode. Neem seed kernel extract (40%), neem oil (40%), carbofuran,flubendiamide, rynaxypyr ,emamectin benzoate , a ready-mix formulation of triazophos 40% + cypermethrin 4%, leaf extract of Alstoniascholaris and of Calotropis procera are used for treating the plant and there efficiency is compared. Treatment1 (flubendiamide +Neem seed kernel extract), Treatment2 (rynaxypyr+ Neemseedkernelextract) and Treatment3 (emamectin benzoate + Neemseedkernelextract) showed impressive results than Treatment4 (triazophos 40% + cypermethrin 4%), Treatment5 (carbofuran + Neemseedkernelextract+ neem oil), Treatment6 (Calotropis leaf extract) and Treatment7 (Alstonia leaf extract). Treatment1 recorded only 3.92% shoot and 1.62% fruit infestation and Treatment2 and

Treatment3 also showed similar results. Treatment4 and Treatment5 recorded much higher shoot (8.94–9.42%) and fruit damage (6.89–7.52%) and the intensity of the infestation also was higher in these two treatments [41].

- The study consist of nine insecticides of various chemical groups tested on eggplant via laboratory and field trials.The insecticides included in this study were abamectin 1.8EC, azadirachtin 0.03EC , carbosulfan 20EC, cartap 50SP, chlorpyriphos20EC, cypermethrin10EC, lambdacyhalothrin2.5EC, thiodicarb 75WP, flubendiamide 24WG . Laboratory trial was conducted on fourth instar larvae the most destructive stage of leucinode. Field trial was conducted during two consecutive cropping seasons' winter and summer. Based on laboratory trial flubendiamide is highly active against leucinode larva and according to field trial during both seasons carbosulfan was the best in reducing fruit and shoot damage in eggplants [42].

### 2.5.3. About Agrohomoeopathy:

- One of the newest practices introduced in agriculture research is Agrohomoeopathy. Research Projects have proven the efficiency of potentized homoeopathic medicines in altering the physiological activity of plants. It can alter the rate of enzymatic activities, total sugar and protein and chlorophyll contents in plants. Homoeopathy can also eradicate biotic and abiotic stresses upto some extent.The principle of similia is applied to overcome abiotic stresses of plants by some researchers. It is believed that higher dilution of drugs (1:500 or 1:1000) with water is more effective for plants. Proper selection of drug and its potency, agrohomeopathy can be an efficient and very cost-effective alternative that can increase farmers' income by lowering the input cost of Chemical fertilizers and insecticides [43].
- Applied Homoeopathy Research in agriculture show the mode of action of homoeopathy remedies and similimum of drug pictures for use in agriculture. Significant results have been observed using Homoeopathy medicines Silicea12, Dulcamara 30 and Sulphur 6c to fight stress caused during wet weather and also during hot and dry conditions. Research results in improving germination and growth; to control pest, disease and viral infection on various crops have been reported [44].

## 3. AIMS AND OBJECTIVES:

- To assess the efficacy of SAMBUCUS 30C and BOMBYX PROCESSIONEA 30C with that of SAMBUCUS 200C and BOMBYX PROCESSIONEA 200C in reducing LEUCINODES ORBONALIS attack on Solanum melongena.
- To improve the growth, yield and the resistance capacity of Brinjal with the help of homoeopathic drugs.
- To compare the pesticidal action of SAMBUCUS NIGRA 30C, 200C and BOMBYX PROCESSIONEA 30C, 200C in the management of LEUCINODES ORBONALIS in Solanum melongena.
- To increase the nutrient level of the plant treated withSAMBUCUS NIGRA and BOMBYX PROCESSIONEA

## 4. MATERIALS AND METHOD

### 4.1.1. Environmental requirements:

- **SEEDS -** Seeds were collected from the organic nursery (Kk.district, Tamilnadu).
- **SOIL** - Loam and sandy soil was used to grow the plant.
- **TEMPERATURE** - Plant was grown at a temperature ranging from70F and 85 F.
- **SUNLIGHT** - The plant was grown in an area where proper sunlight was available.

Fig: 1

(a)

(b)

- **GROW BAGS** - Grow bags were used, in which loam and sandy soil was filled.

Fig: 2

### 4.1.2. MEDICINES USED:

| | |
|---|---|
| 1.SAMBUCUS NIGRA 30C | 2.SAMBUCUS NIGRA 200C |
| 3.BOMBYX PROCESSIONEA 30C | 4.BOMBYX PROCESSIONEA 200C |

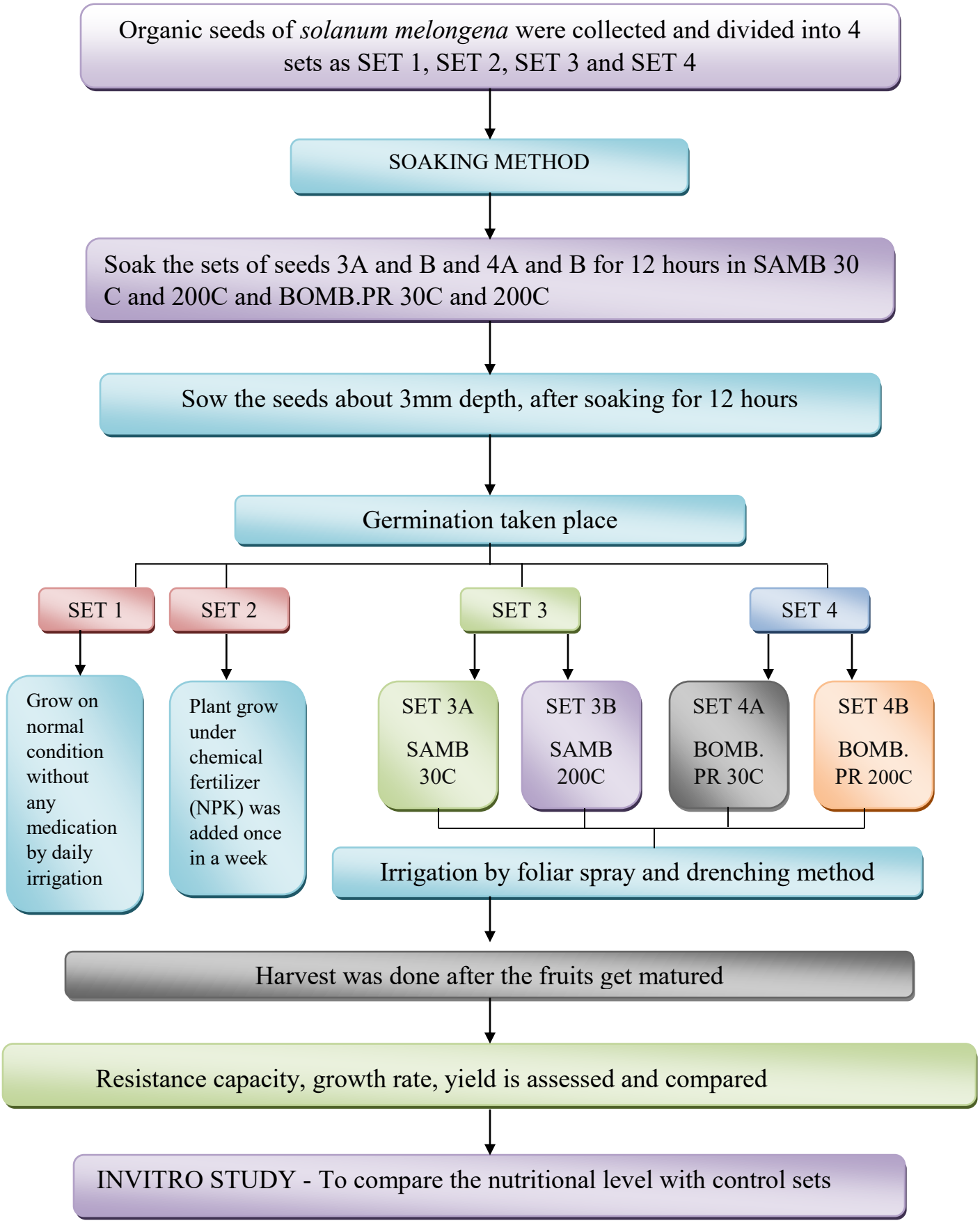
Fig: 3


SAMB 30 SAMB 200 BOMB.PR 30 BOMB.PR 200

### 4.2. SOAKING DETAILS:

- Seeds were soaked for 12 hours in 200 ml of water mixed with SAMB30C, SAMB 200C, BOMB.PR 30C, BOMB.PR 200C.
- Each set contains 5 seeds.
- Soaked on: APRIL 5rd 2022.
- Sow on: APRIL 6th 2022.
- Soaking the seeds will significantly decrease the amount of time it takes for a seed to germinate

**4.3. DETAILEDALGORITHM:**



**4.3.1.** METHODOLOGY IN BREIF**:**

- Seeds of Solanum melongena (eggplant) of the same origin were collected from organic nursery and are divided into 6 sets which were as S1, S2, S3A, S3B & S4A, and S4B.
- Sets S3A, S3B & S4A, and S4B and were soaked in homoeopathic dilutions of SAMB 30C, SAMB 200C, BOMB.PR 30C and BOMB.PR 200C respectively.
- After 12 hrs of soaking, seeds were sowed in about 3mm depth.
- Medicinally untreated seeds were sowed in a two bags and named as S1 &S2 which were treated with organic and chemical fertilizers respectively.
- Control set S1 is grown under normal condition without any medications and S2 is treated with chemical fertilizer (NPK).
- Germination rate, flowering rate, stem, leaf, plant height, fruits of both control and medicinally treated plants were observed.

**4.4.** METHODS USED FOR IRRIGATION:

1. FOLIAR SPRAY METHOD- the corresponding homoeopathic medicine was been mixed with water and sprayed once in a day.

Fig: 4

2. DRENCHING METHOD – the corresponding homoeopathic medicine was mixed with the water and drenched in soil once a day.
3. IRRIGATION PROCESS – all the sets of plants were irrigated once a day.

**4.5.** PRECAUTIONS FOLLOWED:

- Water which doesn't change the quality of homoeopathic medicines was used.
- Equipments which were used for the growth (watering) of the plants should be free from other chemicals or the chemical fertilizer/pesticides as they may inhibit the action of homoeopathic medicines. Rinse well with hot water, if necessary.
- Make sure that the fertilizers which were used for the control plant is not in contact with the other plants, so that the energetic effects of the treatment can never be prevented.
- Store the homoeopathic dilutions away from direct sunlight, moisture and high temperature areas which may affect its quality and also keep away from mobile phones and microwave ovens etc.

## 5. GERMINATION RATE:

In SET 1 AND SET 2 – germination took place 5days after sowing.

In SET 3 AND SET 4 - germination took place 3 days after sowing.

Fig: 5

(a) (b)

5 days after germination 3 days after germination

Fig: 6


(a) (b) (c) (d) (e) (f)

## 5.1. FLOWERING PATTERN:

0n the 40th day the first flower was produced in a plant which was treated with SAMB 200(S.3B)

Fig: 7

(a)

(b)

(c)

## 5.2. COMPARISON OF THE FLOWER IN MEDICINALLY TREATED AND UNTREATED PLANT:

Medicinally treated

medicinally untreated

Fig: 8

(a)

(b)

The flower which was medicinally treated was comparatively large and also some flowers had extra petals, looked healthier than the control sets.

### 5.3. FRUITS:

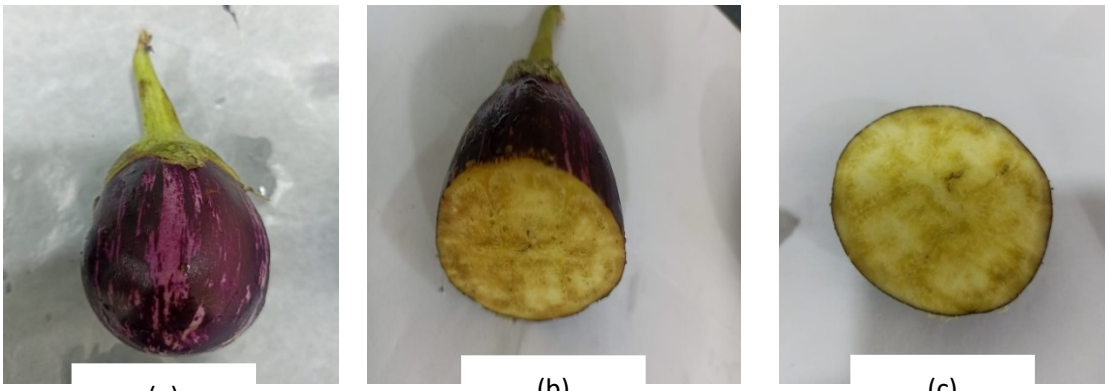
First fruit was developed in SAMB 200 (Set 3B) on 80th day.

Fig: 9

### 5.4. COMPARISON OF FRUITS IN MEDICALLY TREATED AND UNTREATED PLANTS

MEDICINALLY TREATED:

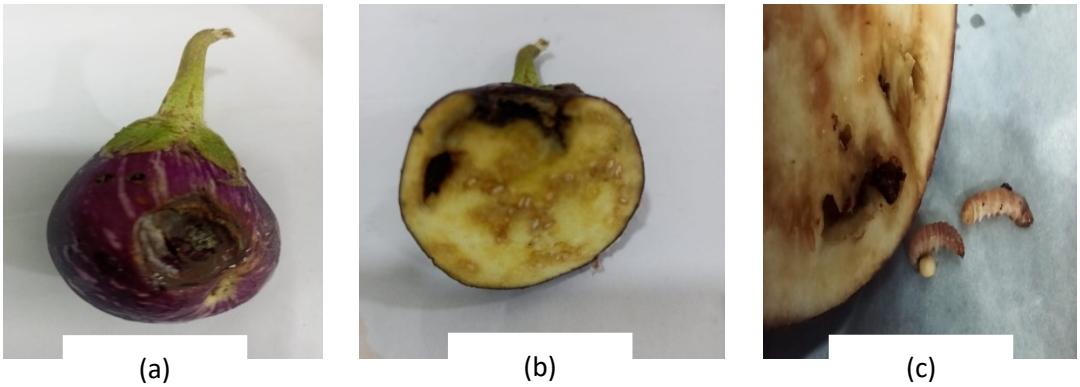
Fig: 10



(a) (b) (c)

MEDICINALLY UNTREATED:

Fig: 10.1



(a) (b) (c)

### 5.5. PARAMETERS TAKEN INTO ACCOUNT:

- Growth rate
- Length of the shoot
- Flowering rate
- No. of flower
- No. of fruits
- No of fruits affected

## 6. OBSERVATION AND RESULTS

### 6.1. GERMINATION RATE

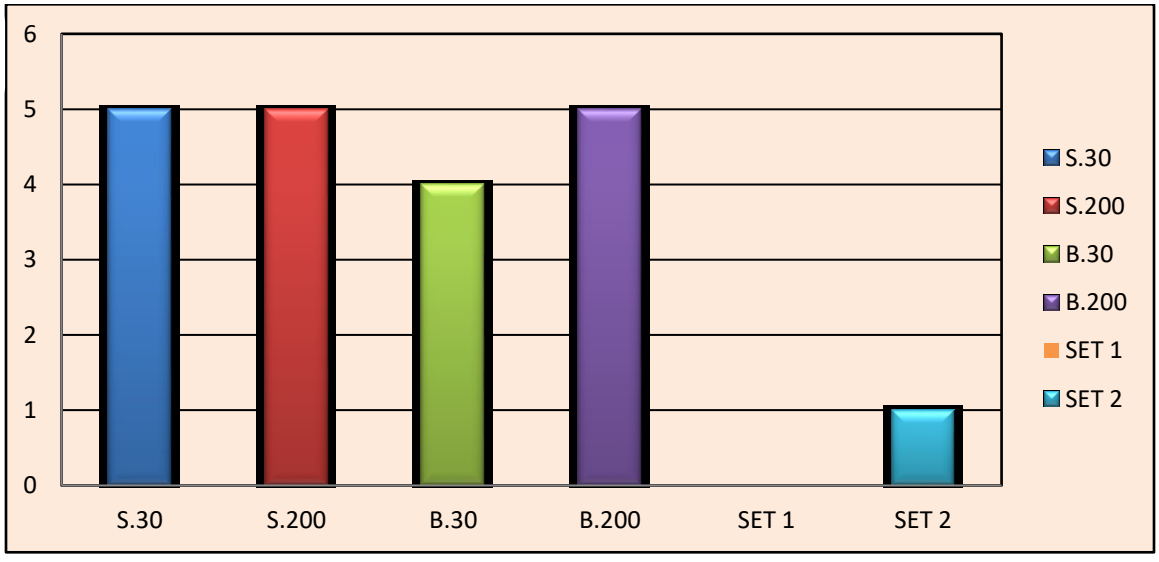
**Observation:** Seeds were sowed on 6/4/2022. On 9/4/2022 Among the 5 seeds per each set, there were a varied number of seeds which germinated. Maximum seeds germinated in the set which contains seeds soaked in Sambucus germination was moderate in Bombyx and was minimum in the control sets. After few days some seeds were germinated from the control sets. Homoeopathic medicines significantly reduce the time it takes for a seed to germinate.

Table: 1

| SETS | SET 1 | SET 2 | SET 3A | SET 3B | SET 4A | SET 4B |
|---|---|---|---|---|---|---|
| | | | S.30 | S.200 | B.30 | B.200 |
| DAY 3 | 0 | 1 | 5 | 5 | 4 | 5 |

Germination rate of both soaked and unsoaked seeds

Graph: 1



## 6.2. GROWTH RATE OF PLANT WHICH ARE MEDICALLY TREATED

**OBSERVATION:** All the medicated sets showed a maximum growth when compared to the control sets. Among all the medicated sets of the plant, SAMB 200C SET 3(B) showed maximum growth.

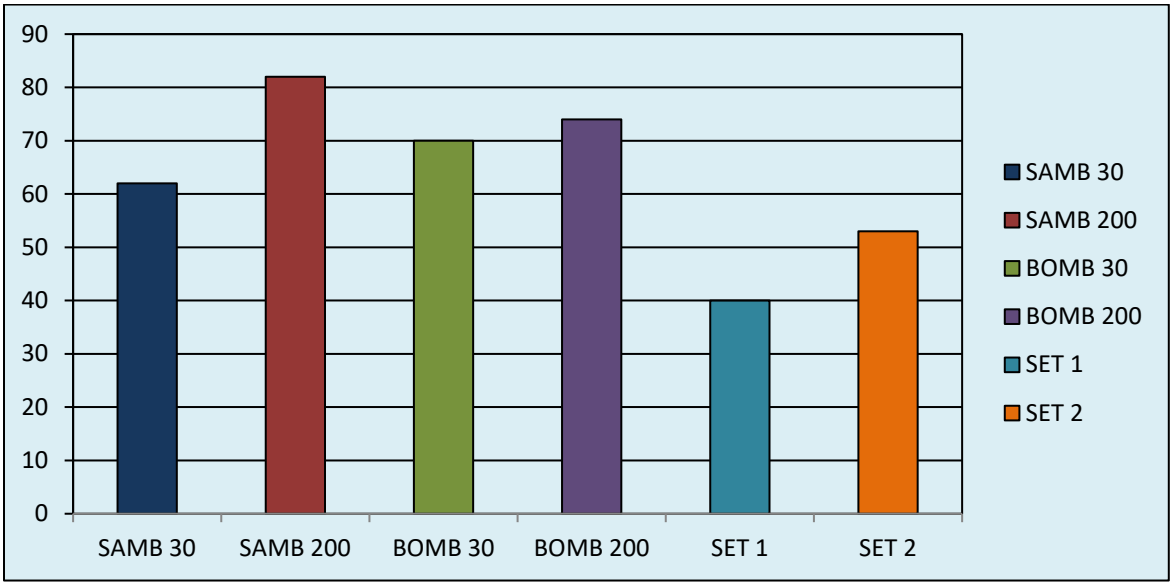
Table: 2 Growth rate of plants which are medically untreated

| DAY | SAMB 30 | SAMB 200 | BOMB 30 | BOMB 200 |
|---|---|---|---|---|
| 10 | 5 | 4 | 4 | 5 |
| 26 | 7 | 8 | 10 | 6 |
| 40 | 20 | 22 | 19 | 21 |
| 70 | 60 | 74 | 67 | 68 |
| 80 | 62 | 82 | 70 | 74 |

Table: 2.1 Growth rate of plants which are medically untreated

| DAY | SET 1 | SET 2 |
|---|---|---|
| 10 | 3 | 3 |
| 26 | 6 | 5 |
| 40 | 12 | 15 |
| 70 | 32 | 50 |
| 80 | 40 | 53 |

Graph: 2 Growth rate in plants which were both medicinally treated and untreated:




| ANOVA FOR LENGTH OF PLANTS | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| Day10 | Between Groups | 4.000 | 5 | .800 | 1.5425 | .545 |
| | Within Groups | 1.234 | 1 | 1.234 | | |
| | Total | 5.234 | 6 | | | |
| Day26 | Between Groups | 16.000 | 5 | 3.200 | 2.229 | .456 |
| | Within Groups | 1.435 | 1 | 1.435 | | |
| | Total | 16.000 | 6 | | | |
| Day40 | Between Groups | 74.833 | 5 | 14.967 | 1.292 | .000 |
| | Within Groups | 19.341 | 1 | 19.341 | | |
| | Total | 74.833 | 6 | | | |
| Day70 | Between Groups | 1179.500 | 5 | 235.900 | 2.16 | .231 |
| | Within Groups | 109.439 | 1 | 109.439 | | |
| | Total | 1179.500 | 6 | | | |
| Day80 | Between Groups | 1159.500 | 5 | 231.900 | 1.878 | .004 |
| | Within Groups | 123.45 | 1 | 123.450 | | |
| | Total | 1159.500 | 6 | | | |

P value for the day 40 and day 80 for the length of plants is highly significant when compared between the treatment group $P < 0.01$.

## 6.3. COMPARISON OF FLOWERING RATE IN PLANTS WHICH WERE MEDICALLY TREATED AND UNTREATED:

**Observation**: Flowering was seen more in SAMB 200 S.3B, and moderately in BOMB 200 S.4B, and minimum in the controlled sets S1 and S2.

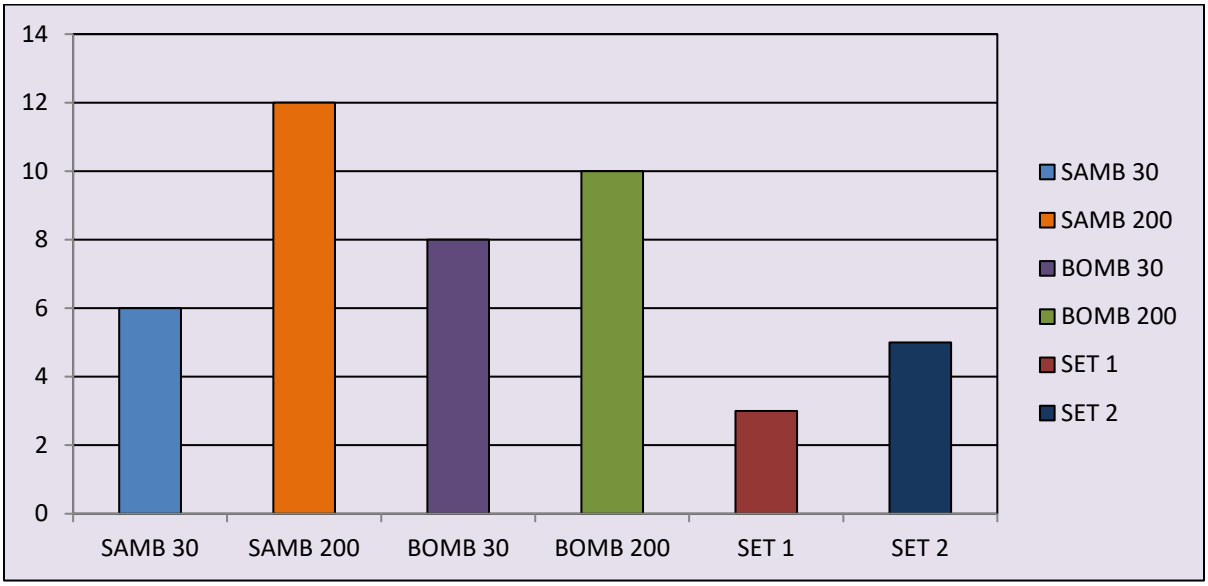
Table: 3 Flowering rate in medically treated plants

| DAY | SAMB 30 | SAMB 200 | BOMB 30 | BOMB 200 |
|---|---|---|---|---|
| 45 | 3 | 5 | 2 | 4 |
| 52 | 4 | 8 | 4 | 6 |
| 60 | 6 | 10 | 7 | 8 |
| 64 | 6 | 12 | 8 | 10 |

Table: 3.1 Flowering rate in medically untreated plants

| DAY | SET 1 | SET 2 |
|---|---|---|
| 45 | 0 | 2 |
| 52 | 2 | 2 |
| 60 | 2 | 4 |
| 64 | 3 | 5 |

Graph: 3 Flowering rate in plants which were medically treated and untreated




| 2. ANOVA FOR FLOWERING RATE | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| Day45 | Between Groups | 15.333 | 5 | 3.067 | 2.06 | .141 |
| | Within Groups | 1.533 | 1 | 1.533 | | |
| | Total | 16.866 | 6 | | | |
| Day52 | Between Groups | 27.333 | 5 | 5.467 | 2.25 | .452 |
| | Within Groups | 12.324 | 1 | 12.324 | | |
| | Total | 39.657 | 6 | | | |
| Day60 | Between Groups | 40.833 | 5 | 8.167 | 1.39 | .000 |
| | Within Groups | 11.324 | 1 | 11.324 | | |
| | Total | 52.157 | 6 | | | |
| Day64 | Between Groups | 55.333 | 5 | 11.067 | 1.19 | .231 |
| | Within Groups | 13.232 | 1 | 13.232 | | |
| | Total | 68.565 | 6 | | | |

The P value for day 60 for the flowering rate of plants is highly significant $P<0.01$.

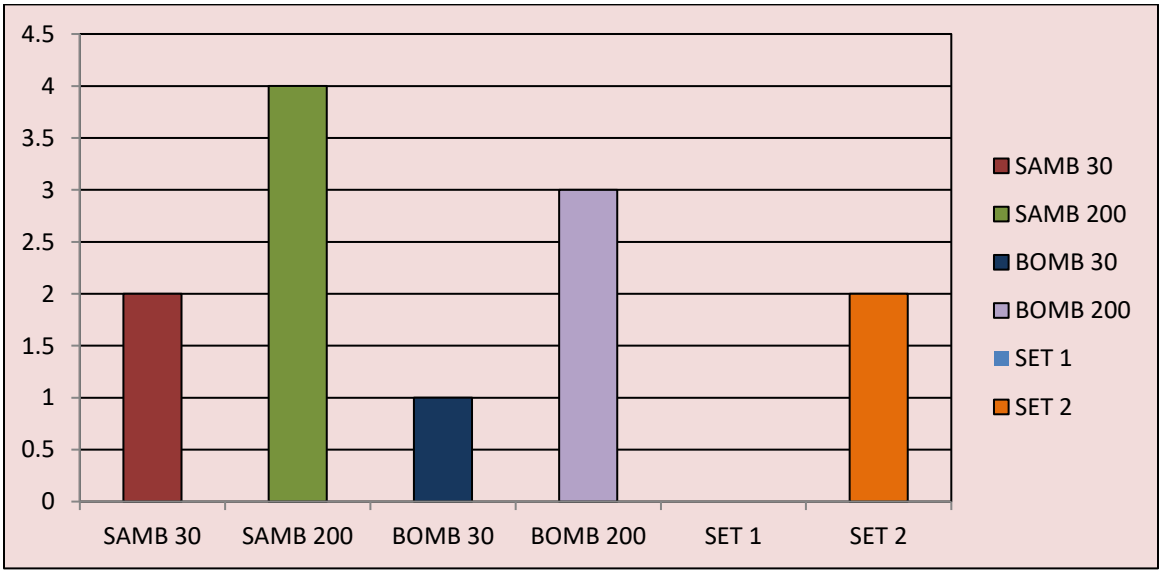
## 6.4. COMPARISON OF YIELD RATE WITH MEDICALLY TREATED PLANTS WITH UNMEDICATED PLANTS

**Observation**Total number of fruits was observed to be maximum in the medicated sets when compare to the control sets. Among the sets, SAMB 200 S.3B show maximum yields.

Table: 4 Yield rate of plants

| DAY | SAMB 30 | SAMB 200 | BOMB 30 | BOMB 200 | SET 1 | SET 2 |
|---|---|---|---|---|---|---|
| 65 | 0 | 1 | 0 | 0 | 0 | 0 |
| 70 | 1 | 2 | 0 | 1 | 0 | 0 |
| 78 | 1 | 2 | 1 | 1 | 0 | 1 |
| 84 | 2 | 4 | 1 | 3 | 0 | 2 |

Graph: 4 Yield rate of medically treated plants and unmedicated plants



| 3. ANOVA FOR YIELD RATE OF PLANTS | | | | | | |
|---|---|---|---|---|---|---|
| | | Sum of Squares | df | Mean Square | F | Sig. |
| Day65 | Between Groups | 0.833 | 5 | .167 | 2.05 | .935 |
| | Within Groups | 0.341 | 1 | .341 | | |
| | Total | 1.174 | 6 | | | |
| Day70 | Between Groups | 3.333 | 5 | .667 | 1.85 | .343 |
| | Within Groups | 1.231 | 1 | 1.231 | | |
| | Total | 4.564 | 6 | | | |
| Day78 | Between Groups | 2 | 5 | .400 | 2.5 | .000 |
| | Within Groups | 1 | 1 | 1 | | |
| | Total | 3 | 6 | | | |
| Day84 | Between Groups | 10 | 5 | 2.000 | 1.000 | .005 |
| | Within Groups | 2 | 1 | 2 | | |
| | Total | 12 | 6 | | | |

The P value for day 78 and day 84 for the yield rate of plants is highly significant P<0.01.

## 6.5. COMPARISON OF YEILD WHICH HAVE BEEN AFFECTED AND NOT AFFECTED BY PEST

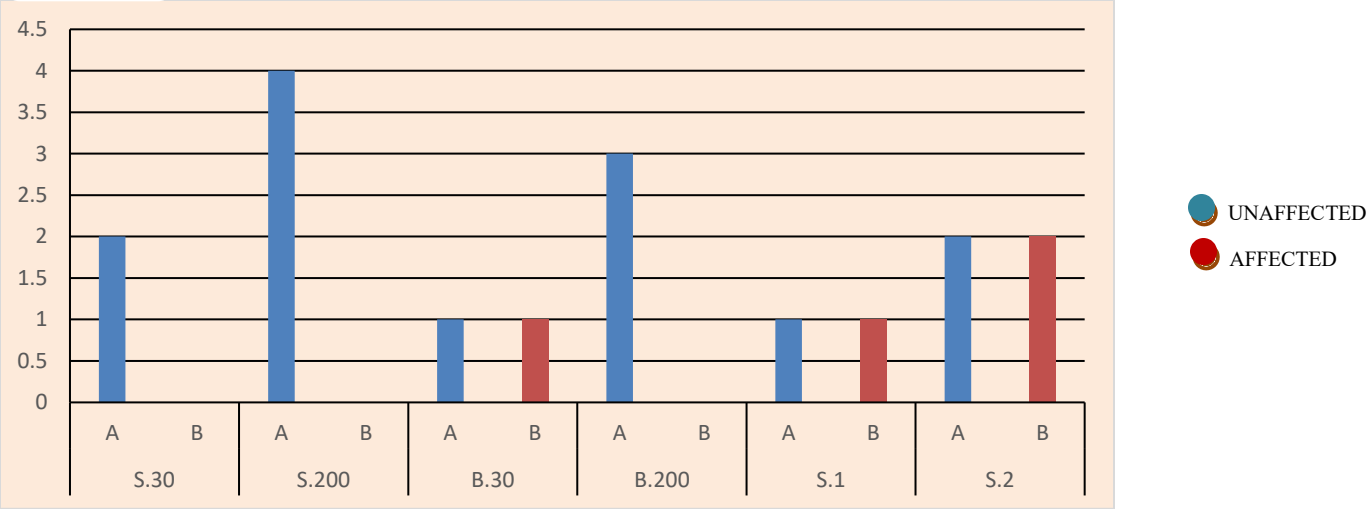
**Observation** total no of fruits were affected more in the controlled set when compared to medicated sets. Among the sets SAMB 200 S.3B has shown maximum result.

Table: 5 Comparison of yeild which have been affected and not affected by pest

| S.30 | | S.200 | | B.30 | | B.200 | | S.1 | | S.2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B | A | B | A | B |
| 2 | 0 | 4 | 0 | 1 | 1 | 3 | 0 | 1 | 1 | 2 | 2 |

**A**-No of fruits not affected by pest, **B**- no of fruits affected by pest

Graph: 5




## 7. QUALITATIVE ANALYSIS

### 7.1.1. ESTIMATION OF CHLOROPHYLL:

**A.REAGENTS USED**

- Chemical used: Acetone
- Preparation of reagent: 80% acetone: 80mL in 20mL of Distilled water

**B.PROCEDURE**:

1. Weigh 1g of finely cut leaf sample which is well mixed and squeezed using a clean mortar.
2. Grind the tissue to a fine pulp and add 2ml of 80% acetone.
3. Centrifuge (5000rpm for 5min) and transferred the supernatant to a new tube.
4. Grind the residue with 2ml of 80% acetone, centrifuge and transfer the supernatant to the same tube.
5. Repeat this procedure until the residue turns colorless. Make up the sample to 10 ml with 80% acetone.
6. Read the absorbance of the solution at 645nm and 663 nm against the solvent 80% acetone blank.

**C.CALCULATION**:

The amount of chlorophyll present in the extract mg chlorophyll per gram tissue using the following equations.

- mg chlorophyll a / g tissue = 12.7 (A663) – 2.69 (A645) ×(V/1000×W)
- mg chlorophyll b / g tissue = 22.9 (A645) – 4.68 (A663) × (V/1000×W)
- Total chlorophyll content =20.2(A645) +8.02(A663) ×(V/1000×W)

Where A = absorbance at specific wavelengths, V = final volume of chlorophyll extract in 80% acetone, W = fresh weight of tissue extracted.

**D.RESULT**

| SAMPLE | OD at 645nm | OD at 663nm | mg chlorophyll a/g tissue | mg chlorophyll b/g tissue | mg total chlorophyll content |
|---|---|---|---|---|---|
| **SET 1** | 0.046 | 0.227 | 0.0780078 | 0.0026881 | 0.0824922 |
| **SET 2** | 0.375 | 0.201 | 0.0463185 | 0.2294046 | 0.2738106 |
| **SET 3 A** | 0.582 | 0.255 | 0.0501876 | 0.3640321 | 0.414045 |
| **SET 3 B** | 1.257 | 2.634 | 0.9021141 | 0.4937454 | 1.3954824 |
| **SET 4A** | 0.271 | 0.182 | 0.0474723 | 0.1606242 | 0.2080152 |
| **SET 4B** | 0.118 | 0.719 | 0.2344164 | 0.0198816 | 0.2444994 |

On estimation of total chlorophyll on SET 3B, SET 4B is higher than other sets.

## 7.1.2. ESTIMATION OF CARBOHYDRATE BY GLUCOSE PAP SL.

### A. Method

Enzymatic –calorimetric GOD-PAP

Trinder end point.

### B. Principle

Enzymatic determination of glucose according to the following reactions.

$$\text{Glucose} + O_2 \xrightarrow{\text{Glucose oxidase}} \text{gluconic acid} + H_2O.$$

$$2H_2O + \text{Phenol} + 4\text{AAP} \xrightarrow{\text{peroxidase}} \text{Quinonimine} + 4H_2O.$$

### C. Reagent composition

- Reagent R
- Phosphate buffer pH 7.4 13.8mmol/L
- Phenol 10mmol/L
- Amino 4 antipyrine 0.3mmol/L
- Glucose oxidase ≥10,000U/L
- Peroxidase ≥700U/L

### D. Standard

D glucose-100mg/dL- 5.55mmol/L

### E. Procedure

This reagent can be used in most analyzers, semi-automaticanalyzers, and manual methods

**F.RESULTS**

| Sample | Mg/100mg of brinjal | 100µ |
|---|---|---|
| SET 1 | 204.6 | 0.9425 |
| SET 2 | 218.5 | 1.0069 |
| SET 3A | 264.9 | 1.2217 |
| SET 3B | 644.6 | 2.9777 |
| SET 4A | 231.3 | 1.0662 |
| SET 4B | 301.1 | 1.3890 |

On estimation of total carbohydrate value of brinjal SET 3B shows higher value than other sets.

**8. DISCUSSION:**

- The study was conducted in order to increase the plant resistance against pest. In Tamilnadu, agriculture is one of the most important means of livelihood. Pest is the main concern that causes potential loss in cultivated plants. By improving the plant resistance against pest we can increase the productivity and thus raising the market value. In this study eggplant is used to understand the effectiveness of homoeopathic medicines in raising the plants resistance towards pest species leucinodeorbonalis. Solanum melongena belonging to Solanaceae family, is cultivated throughout India. Eggplants are easily susceptible to pest attack. Enhancing the resistance of plant towards pest by means of Agrohomoeopathy is the purpose of this study. In this research the homeopathic medicines sambucus nigra and bombyx processionea in potencies 30C and 200C were used.
- Seeds were soaked in the Homoeopathic medicines before sowing. Seeds soaked in the medicine markedly reduce the duration of seed germination. Control sets were irrigated once in days and, medicinally treated plants were irrigated once in a day.
- When the growth (length) of the plants is taken into account, the medicinally treated plants have grown double the height of the control plants. In agrohomoeopathy Sambucus

is considered as the best one in the treatment of plants for increasing pest resistance resulting in healthy plant growth. It acts like a booster to the plants. Regarding Bombyx, it also helps in reducing pest attacks in plants effectively helping in growth of plant. The result shows the beneficial action of Sambucus and bombyx on the growth of the plant.

- Flowering rate of all the medicated plants were maximum when compared to the control sets and the flowers bloomed earlier than its actual time of blooming in all the medicated plants. This shows that the duration for the development of the plant was significantly reduced and yield was obtained earlier.
- In agrohomoeopathy, Sambucus is said to prevent plants from the attack of caterpillars and larvae and silicea can prevent the plants against worms, larva, caterpillars etc. In this study, Sambucus and bombyx enhance the pesticidal action and the insecticidal action in the plants.
- Yield was obtained earlier than its actual time. Homoeopathic medicines sambucus and bombyx significantly lowered the actual duration it takes for the yield production.
- From this study the healthy growth, maturing, development, yield and pesticidalaction is found to be increased. All the plants were grown healthier than the control sets, as they were affected. The data collected from this study shows the effectiveness of sambucus 200C, Sambucus 30C, bombyx 200 C and bombyx 30 C in the agricultural field.
- From this study. Sambucus and bombyx enhanced the plants resistance towards pest. In plant Sambucus act by controlling the insect and pest attack and improving the growth and yield of the plant, which shows its effectiveness in this field. Bombyx shows its effectiveness by preventing harmful pest and supporting the plant to grow healthy when compare to the other sets and control sets as a whole, the dynamic property of the Homoeopathic drugs acts greatly in the plant.
- It is observed that the plants treated with Sambucus 200c showed better carbohydrate and chlorophyll level and were healthier compared to those from other sets.

## 9. CONCLUSION:

- From the above study it is proved that the Homoeopathic dilutions of Sambucus and bombyx are highly effective in improving the resistance of plants against pest and also helps in its healthy growth.

- From this study, the action of Sambucus 200C, sambucus 30C, bombyx 200C and bombyx 30C on increasing the pest resistance of solanum melongena against leucinodeorbonalis were observed, all the drug showed better response when compare to the control sets, among which sambucus 200C came up to be more effective, next to that bombyx 200C shows a better result.
- This study also shows the effectiveness of the homoeopathic drug on the better growth, yield and development of this vegetable crop, among which Sambucus 200C shows a marked development. Developing stages like germination, emerging of buds, blooming of both male and female flowers and the yield were occurred earlier.
- Pesticidal effectiveness was found well in all the medicated plants when compare to the control plants. Among which Sambucus came up with better results. Using Homoeopathic medicines is the best and safest alternative for the harmful chemical pesticides. A lot of chemical pesticides can kill the balance of nature in various ways. This can upset the eco-system.
- Agro Homoeopathy is an inexpensive, chemical free, non-toxic method of healing and protecting the plants and agricultural resources from pests and disease. It strengthens the plant's basic structure allowing it to reach its optimum health, thus reducing and sometimes eliminating the ailments. The reduction of chemicals, antibiotics and de-worming products in livestock will ensure healthier food for human consumption

## 10. SUMMARY:

- This research was conducted to boost up the resistance of eggplant towards the most deleterious pest *leucinodeorbonalis* using homoeopathic medicines Sambucus nigra 30C Sambucusnigra 200C, Bombyx processionea 30C, Bombyxprocessionea 200C .A remarkable upswing was seen in plants treated with homoeopathic medicines when compared with untreated ones.
- The germination rate, growth rate, flowering rate including both male and female flower, yield rate and nutritional value of each sets were observed, noted and compared as follows.

- The germination rate was higher in all the medicated plants when compared to the control sets. Among them, germination rate was higher in the sets SAMB 200C and BOMB.PR 200C.
- The growth rate (length of the shoot) was significantly higher in all the medicated sets of plants especially SAMB 200 has an effective action on increasing its length.
- The flowers bloomed earlier when compared to the control sets and the flowering rate was significantly enhanced by treating with the homoeopathic medicines especially in SAMB 200 and BOMB.PR 200
- Regarding the pests, a significant decrease in the pest attack was observed in all the medicinally treated plants especially plants which were irrigated using both spray and manual method had a healthy leaf when compared to the control sets. Only control sets were affected by the pest.
- With all above observations, it is well known that agrohomoeopathy can lend a helping hand, thereby improving the overall growth of the plants

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# ANNEXURE-I

## STSH 2022
## REPORT ATTESTATION FORM (RAF)

*(To be filled by the Student)*

1. Name of the student : M. PRAKASH RAJA
2. STSH Reference ID : STSH21102237
3. Period for which research was done (Date-DD/MM/YYYY) : From 5/4/22 Till 21/7/22
4. Special research technique and methodology, if any, learnt : Agrohomoeopathy
5. Personal impressions of the student about the STSH program and what has The student gained from it : I had done various literature reviews on the topic Agrohomoeopathy

*(To be filled by the Guide)*

6. General Remarks of the Guide on Student's work & aptitude for research : Completed the research work in time with great enthusiasm and dedication

### UNDERTAKING

1. We, M. PRAKASH RAJA (Name of Student) student of **(tick appropriate)** BHMS I/II/III/IV ✓ year & Dr. RESHMY. K. R (Name of Guide) declare that we have abided by the Instructions and Terms & Conditions for STSH program given on CCRH website.
2. We had obtained necessary approvals from IEC/IAEC & Informed consent from participants (not applicable for animal studies).
3. We confirm that the data is our own and has not been plagiarized from any other source.
4. **We are aware that CCRH reserves the right to reject the report if the report is not prepared/submitted as per given instructions/report is incomplete/incorrect/not as per the objectives already laid in the proposal/not as per CCRH format/submitted later than 31st , August 2022/any other technical reasons deemed suited by CCRH**
5. The information/research findings in report are true to best of our knowledge. We shall respect decision of CCRH.
6. We understand that scientific/personal details of other students/ guides/ copies of projects/titles/reviewers/ decision of reviewers/ minutes of meeting/ marks /scores *etc.* are confidential.
7. For presentation/publication of the scientific findings (oral/poster/abstract/paper) in any conference/ seminar/ meetings/ journals, due acknowledgement would be given to CCRH.
8. We understand that the e-certificate and stipend may be issued to the student only after approval and selection of the final report by the expert review committee for award of STSH scholarship.

**Signature of the Student** M. Prakash Raja 30.8.22
**(With Date)**
**Name of the Student** M. PRAKASH RAJA

**Signature of the Guide** 30.08.2022
**(With Date)**
**Name and Designation** Dr RESHMY K.R
**(With Seal)** Professor, Dept. of Physiology
H.O.D
Department of Physiology & Biochemistry
Sarada Krishna Homoeopathic
Medical College
Kulasekharam-629 161, Tamilnadu

## ANNEXURE-II

Sarada Krishna
Homoeopathic Medical College
Kulasekharam, Kanyakumari district, Tamil Nadu -629161

**RESEARCH FACILITATION CENTRE**

CENTRAL RESEARCH LABORATORY

# CERTIFICATE

**To whomever it may concern.**

This is to certify that the biochemical analysis done in this research work entitled entitled **"A comparative study on the effectiveness of Pesticidal action of *Sambucus nigra* and *Bombyx processionea* against *Leucinodes orbonalis* in *Solanum melongena*** a work done by **M.Prakash Raja** of Sarada Krishna Homeopathic Medical College, Kulasekaram has been carried out in the Central Research Laboratory of Sarada Krishna Homoeopathic Medical College under my guidance.

Place: Kulasekaram
Date: 30.08.2022

Dr C.V.Chandraja
(Biochemist)

## ANNEXURE-III

CERTIFICATE

To whomever it may concern

This is to certify that research work entitled "A COMPARATIVE STUDY ON THE EFFECTIVENESS OF PESTICIDAL ACTION OF SAMBUCUS NIGRA AND BOMBYX PROCESSIONEA AGAINST LEUCINODES ORBONALIS IN SOLANUM MELONGENA" a work done by Mr. PRAKASH RAJA M from Sarada Krishna Homoeopathic Medical College and Hospital as a Short Term Studentship Program 2021-2022 conducted by Central Council Research for Homoeopathy (CCRH). Her work has been carried out under my direct supervision and guidance. This work is recommended for submitting final report and further publication

Place : kanyakumari

Date : 20/08/2022

Dr. S. Jaya Kumar Ph.D
Asso. Professor of Botany
N.M. Christian College
Marthandam, Kanyakumari Dist