

International Research Journal of Management Science & Technology



ISSN 2250 – 1959(Online)
2348 – 9367 (Print)

An Internationally Indexed Peer Reviewed & Refereed Journal

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Published by iSaRa Solutions

Diversity of pest insect and diseases in *Mentha piperita* L. field cultivation A case in Gangetic region district Badaun Uttar Pradesh

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I. ABSTRACT

Mints (*Mentha* species) are very familiar aromatic herbs, grown in India and several other countries of the world for essential oils that are widely used in the food, pharmaceutical, cosmetic, and perfumery industries. This review describes various diseases in mint under the four sub-topics: fungal, nematode, viral and phytoplasmal, and bacterial. A review of the literature reveals that the most economically serious diseases are caused by the fungi *Puccinia menthae* (rust), *Alternaria alternata* (leaf spot); *Verticillium dahliae* (wilt), *Phoma stasserti* (stem rot), *Rhizoctonia solani/bataticola* (root and stolon rot) and *Erysiphe cichor-acearum* (powdery mildew). With mints, as with other crop plants, fungicides are used to control disease. Several studies suggest that the control of disease through chemicals appears more attractive if the pathogen is present in the planting material (stolon, sucker or runner) and a small area is treated for producing a healthy disease-free nursery. For effective chemical control against multiple diseases, application of propiconazole is frequently used. This review on mint diseases indicates that considerable progress has been achieved with respect to the identity of the causal organisms, and chemical control measures, but not much work has been dedicated for developing resistant crop varieties against the diseases. Because persistence of diseases in mints is very common due to vegetative propagation of the hosts, developing alternative means of propagation that would break the continuum in disease transmission becomes imperative. Analysis of the current research indicates that the development of seed-producing genotypes through breeding would be an attractive. The aim of study to determine insect diversity studies were conducted in *Mentha* plant in different Eight place of Badaun District for sampling visits consists of 3 phases, starting from Pre-sowing phase, sowing /plantation phase and vegetative phase There are 4 sampling methods were used, i.e. sweeping net, sticky yellow trap, and core sampler. A total of 1365 individuals of insects, representing 37 species in 24 families and 8 orders. The most abundant insects were order Lepidoptera

Keywords: Peppermint, peppermint oil, medicinal herbs, drying of mints

II. Introduction

Mints belong to the genus *Mentha* and comprise approximately 20 species in the plant family Lamiaceae and are grown for their leaves which are widely used as a flavoring. Mint plants are mainly aromatic perennials and they possess erect, branching stems and oblong to ovate or lanceolate leaves arranged in opposing pairs on the stems. The leaves are often covered in tiny hairs and have a serrated margin. Mint plants produce a terminal flower spike and the flowers can be white or purple in color depending on variety. Mint plants are fast growing and can become very invasive. They can reach heights of 60–90 cm and will continue to grow for many years once established. Mint may also be referred to by species and these include, but are not limited to peppermint, spearmint, water mint

and Japanese mint. Mint plants enable improvement of pest management by attracting herbivore enemies to constitutively released mint volatiles. The generalist predator *Nesidiocoris tenuis* is used worldwide to control agricultural pests, but little is known about whether mint can serve as a companion plant that attracts this predator. To examine this, olfactory responses of *N. Tenuis* were assessed using apple mint, candy mint, and spearmint as odour sources.

III. Materials and method

Description of study site.

Geographically BUDAUN City is located near Holy River GANGA , at Latitude 28 Degree 02 Minute 30 Second East & Longitude 79 Degree 01 Minute 20 Second North on Globe. Length of District is 144 Km. & Width is 60 Km. And Total area of District is 4234Sq. Geographically



BUDAUN City is located near Holy River GANGA (), at Latitude 28 Degree 02 Minute 30 Second East & Longitude 79 Degree 01 Minute 20 Second North on Globe. Length of District is 144 Km. & Width is 60 Km. And Total area of District is 5168 Sq. Km. Budaun City is 235 Km. From Delhi & 311 Km. From Lucknow. Budaun has average elevation of 169 metres (554 feet).

Methodology

The procedures used in this study include collecting Of insect samples from the mint field, specimen preservation, Preparation and identification at the laboratory Pests and Diseases.

Sampling visits were conducted during Suitable time for timely sowing of mentha is 15th January to 15th February. In case of late sowing, oil content is reduced and results in low yield. For late sowing, prepare the plants in nursery and plant it between March to first week of April in the field. Five sampling methods were employed, namely the use of

Sweeping nets, yellow sticky traps, and pitfall traps.

Keep the distance between row to row 30-40 cm in planting of Japanese mentha, 45-60 cm in desi pudina and plant to plant 15 cm in Japanese pudina. The root should be sown 15 cm deep in ridges. Irrigate lightly immediately after sowing. For sowing/planting, 4-5 quintal roots of 8-10 cm piece are sufficient.

Data analysis

Insect diversity and richness over the sampling period are determined and while significant differences between the insect populations in the mentha plots are statistically determined

IV. Results and discussion

Category : Insects

Aphids (Peach aphids)

Cutworms: *Agrotis* spp., *Socotra exigua* (Hübner) (Lepidoptera: Noctuidae)

Tobacco caterpillar: *Spodoptera litura* (Fabricius) (Lepidoptera: Noctuidae)

Aphids (Peach aphid): *Myzus persicae* Sulzer (Hemiptera: Aphididae)

Mealy bug: *Planococcus citri* Risso (Hemiptera: Pseudococcidae)

Flea beetle: *Longitarsus ferrugineus* Foudras (Coleoptera: Chrysomelidae)

Hairy Caterpillar: *Spilosoma obliqua* Walker (Lepidoptera: Arctiidae)

Red Pumpkin Beetle: *Aulocophora foenicollis* Lucas (Coleoptera: Chrysomelidae)

Leaf webber: *Syngamia abruptalis* Walker (Lepidoptera: Pyralidae)

Semilooper: *Thysanoplusia orichalcea* (Lepidoptera: Nocuidae)

Spider mites (Two-spotted spider mite): *Tetranychus urticae* C. L. Koch. *Peanonychus* spp. (Acari: Tetranychidae)

Diseases

Mint rust: *Puccinia menthae* Pers.

Verticillium wilt: *Verticillium dahliae* Kleb

Stem and stolon canker: *Rhizoctonia solani* Kühn

Powdery Mildew: *Erysiphe cichoracearum* DC.

Black Stem Rot: *Phoma strasseri* Moesz

Anthracnose: *Sphaceloma menthae* Jenk.

Septoria leaf spot: *Septoria menthae* Oudem.

Ramularia leaf spot: *Ramularia menthicola* Sacc.

Stolon decay: *Fusarium solani* (Mart.) Sacc

Leaf blight: *Cephalosporium* sp.

Nematodes

Root lesion nematode: *Pratylenchus penetrans* Cobb Pratylenchidae

Pin nematodes: *Paratylenchus hamatus* Thorne & Allen, *P. Microdorus* Andrassy, *P. Macrophallus* (de Man) Goodey (Tylenchulidae)

Common Pests and Diseases

FUNGAL DISEASE :

Mint rust



Disease symptoms:

- Pale and distorted shoots in spring
- Dusty orange pustules on the stems and leaves.
- Pustule may change to dusty yellow or black in colour in later stage
- Large areas of leaf tissue die and plants may lose leaves

Survival and spread:

- When the orange spore pustules mature and break open in June or July, the spores are spread to other plants by the wind.
- The fungus enters the plant through the leaves |Newly infected plants seldom show symptoms until the following spring.

Favorable conditions:

- Dry weather with high relative humidity
- Pathogens overwinter on mint stubble & on wild mint.
- It spreads through propagation material and air

Management

Infected plants and rhizomes should be removed to prevent spread; heat treatment of roots may help to control the disease; roots should be immersed in hot water at 44°C (111°F) for 10 minutes, cooled using cool water and then planted as usual

Verticillium wilt



Disease symptoms:

- Symptoms first appear in the foliage at the top of the plant.
- Symptomatic upper leaves are sickle-shaped and initially chlorotic or red, soon becoming necrotic.
- Premature defoliation and death of the plant can result.
- Vascular discoloration in stems and roots may be observed and diseased plants are often stunted.

Survival and spread:

- The transport of infected planting materials can transmit the pathogen to long distances.
- Spread of the pathogen occurs primarily by soil and movement of soil and water.

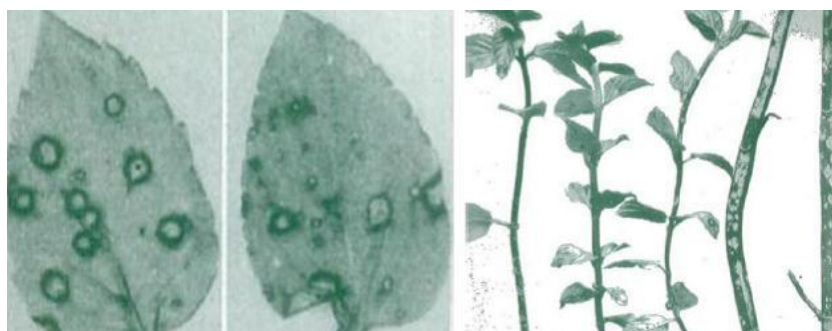
Favourable conditions:

- Verticillium wilt is favored by moist soils and a temperature range of 21-27° C.
- Micro-sclerotia are stimulated to germinate by root exudates of host plants

Disease management:

- Application of ground sulphur or wettable sulphur@ 0.2%. Spraying of Hexasul or Karathane WD 0.05% at 15 days interval

Anthracnose



Disease symptoms:

- Mint anthracnose, also known as “leopard spot”.
- The fungus causes small, sunken brown spots to appear on the lower leaves and stems. These spots enlarge to form oval lesions with light gray centers and reddish-brown borders, and may unite.
- Mint anthracnose may cause defoliation and cankers, which may lead to splitting of the stem.
- Heavily-infected plants are weakened and oil yields are reduced.
- Anthracnose may become severe during wet seasons when the mint foliage is wet for long periods.

Survival and spread:

- Conidia are rain-splashed from overwintering infected plant in the spring and throughout the summer to new growth.

Favourable conditions:

- Infection requires three to twelve hours of wetness.

Powdery mildew



Disease symptoms:

- Powdery white patches are developed on the upper and lower surfaces of the leaves and stems.
- Under favourable conditions, the disease causes severe losses. It also reduces the oil

Survival and spread:

- Resting spores is responsible for primary spread and airborne spores for secondary spread.

Favourable conditions:

- Disease becomes severe when weather is dry and air circulation is poor (warm and humid weather)

Black Stem Rot



Disease symptoms:

- Black stem rot is considered a moderate to serious problem in mint production.
- The fungus is most active during periods of cool and wet weather.
- Symptoms of infection include dark brown or black cankers on stems.
- Cankers may girdle the stem and cause plant parts above the infection to wilt and die.

Survival and spread:

- Pathogen survive in soil and on plant tissue for many years by producing small (1 to 3-mm diameter), irregular-shaped, brown to black sclerotia.

Favourable conditions:

- Disease become more severe in soils that are moderately wet and a temperature range of 15-25°C

Stem and stolon canker

Disease symptoms:

- Roots and stolon have brown or black progressively rotting areas. Plant stand may be greatly reduced.

Survival and spread:

- Pathogen survive on crop debris and in soil as black to brownish resting structures (sclerotia) or as resting fungal mycelium.

Favourable conditions:

- Warm soil with high humidity is favorable for disease development.
- Temperatures between 26-32°C, soil moisture between 30-60% and soil pH above 6.6 are conducive for disease development.

Septoria leaf spot

Disease symptom:

- Septoria leaf spots are dark brown/black, up to 3mm (1/8in) diameter and angular in shape (being constricted between leaf veins).
- Spores are sometimes visible within leaf spots on the underside of the leaf.

Survival and spread:

- The fungus survive in plant debris and on weeds .

Favourable conditions:

- Moist (more than 70% relative humidity) coupled with warm weather and intermittent rains favours disease development.

Pests

Category : Insects

Aphids (Peach aphid) Myzus persicae



Symptoms

- Small soft bodied insects on underside of leaves and/or stems of plant; usually green or yellow in color, but may be pink, brown, red or black depending on species and host plant; if aphid infestation is heavy it may cause leaves to yellow and/or distorted, necrotic spots on leaves and/or stunted shoots; aphids secrete a sticky, sugary substance called honeydew which encourages the growth of sooty mold on the plants

Cause Insects

Comments

- Distinguishing features include the presence of cornicles (tubular structures) which project backwards from the body of the aphid; will generally not move very quickly when disturbed

Management

- If aphid population is limited to just a few leaves or shoots then the infestation can be pruned out to provide control; check transplants for aphids before planting; use tolerant varieties if available; reflective mulches such as silver colored plastic can deter aphids from feeding on plants; sturdy plants can be sprayed with a strong jet of water to knock aphids from leaves; insecticides are generally only required to treat aphids if the infestation is very high – plants generally tolerate low and medium level infestation; insecticidal soaps or oils such as neem or canola oil are usually the best method of control; always check the labels of the products for specific usage guidelines prior to use

Cutworms *Agrotis* spp.



Symptoms

- Stems of young transplants or seedlings may be severed at soil line; if infection occurs later, irregular holes are eaten into the surface of fruits; larvae causing the damage are usually active at night and hide during the day in the soil at the base of the plants or in plant debris of toppled plant; larvae are 2.5–5.0 cm (1–2 in) in length; larvae may exhibit a variety of patterns and coloration but will usually curl up into a C-shape when disturbed

Cause Insect

Comments

- Cutworms have a wide host range and attack vegetables including asparagus, bean, cabbage and other crucifers, carrot, celery, corn, lettuce, pea, pepper, potato and tomato

Management

- Remove all plant residue from soil after harvest or at least two weeks before planting, this is especially important if the previous crop was another host such as alfalfa, beans or a leguminous cover crop; plastic or foil collars fitted around plant stems to cover the bottom 3 inches above the soil line and extending a couple of inches into the soil can prevent larvae severing plants; hand-pick larvae after dark; spread diatomaceous earth around the base of the plants (this creates a sharp barrier that will cut the insects if they try and crawl over it); apply appropriate insecticides to infested areas of garden or field if not growing organically

Thrips (Western flower thrips) *Frankliniella occidentalis*

Symptoms

- If population is high leaves may be distorted; leaves are covered in coarse stippling and may appear silvery; leaves speckled with black feces; insect is small (1.5 mm) and slender and best viewed using a hand lens; adult thrips are pale yellow to light brown and the nymphs are smaller and lighter in color

Cause Insect

Comments

- Transmit viruses such as Tomato spotted wilt virus; once acquired, the insect retains the ability to transmit the virus for the remainder of its life

Management

- Avoid planting next to onions, garlic or cereals where very large numbers of thrips can build up; use reflective mulches early in growing season to deter thrips; apply appropriate insecticide if thrips become problematic

Category : Mites

Spider mites (Two-spotted spider mite) *Tetranychus urticae*

Symptoms

- Leaves stippled with yellow; leaves may appear bronzed; webbing covering leaves; mites may be visible as tiny moving dots on the webs or underside of leaves, best viewed using a hand lens; usually not spotted until there are visible symptoms on the plant; leaves turn yellow and may drop from plant

Cause Arachnid

Comments

- Spider mites thrive in dusty conditions; water-stressed plants are more susceptible to attack

Management

- In the home garden, spraying plants with a strong jet of water can help reduce buildup of spider mite populations; if mites become problematic apply insecticidal soap to plants; certain chemical insecticides may actually increase mite populations by killing off natural enemies and promoting mite reproduction

V. Conclusion

In this paper, a proposed expert system was presented for helping Farmers and those interested in agriculture. Mint may suffer from Seven different diseases they have. Farmers and those interested in agriculture can get the diagnosis faster and more accurately than The traditional diagnosis. This expert system does not need intensive training to be used; it is easy to use and has a user-friendly Interface. It was developed using CLIPS Rule-Based Programming Language.

VI. Acknowledgement

The author would like to thank past and present mint and Verticillium wilt researchers for their research efforts towards solving this important problem. The author would also like to acknowledge the U.S. mint industry, mint growers, various state commissions, and the Mint Industry Research Council for coordinating, funding, and supporting Verticillium wilt research in mint at local, state, and national levels. Thank you to Jeness Scott and John Spring for comments and suggestions on earlier versions of this review..

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