

New interventions to manage red spider mite in brinjal

The red spider mite has become one of the most serious threats of brinjal in Northern India. It causes enormous economic loss during May-July. All the varieties and hybrids grown in Northern India have been found susceptible against red spider mite. In our country, acaricides have not been developed which kill eggs, nymphs and adults of red spider mite. Accordingly, we have identified the acaricide namely hexythiazox which kills the eggs, whereas another acaricide propargite which kills the nymphs and adults. Hexythiazox has ovicidal action while propargite has adulticidal action. Three applications of both the acaricides gave tremendous impact on management of red spider mite and enhancement of production and profitability of brinjal in Dehradun, Uttarakhand.

BRINJAL (*Solanum melongena* L.) is one of the commercially important vegetable crop grown round the year in our country. The area under brinjal has increased considerably from the last one decade due to introduction of high yielding hybrids and varieties, and their suitability to grow even under hot summer and *kharif* seasons. It occupies 0.60 million ha area with the total production of 10.37 million tonnes and the average productivity is 17.30 tonnes/ha and 13.97 tonnes/ha in Uttarakhand which are low as compared to potential yields recorded up to 55.05 tonnes/ha in the field demonstrations carried out at Dehradun (Uttarakhand). The red spider mite, *Tetranychus cinnabarinus* Boisduval is the most common mite species that attacks brinjal. It is one of the most important pests of brinjal during summer and *kharif* season. According to an estimate, incidence of spider mite is 26 to 92% during May to July.

Symptoms of red spider mite

Feeding injury often gives the top surfaces a mottled or speckled, dull appearance. Leaves then turn yellow and drop. Large populations produce visible webbing that can completely cover the leaves. In the field, spider mites are favoured by hot dry weather, which also aggravates injury by stressing the plant. Damage is often underestimated since the wounds and the pest are not apparent to our eyes without close inspection. Leaves become blotched with pale yellow, reddish brown spots ranging from small to large areas on both upper and lower leaf surfaces.

Life cycle of red spider mite and transmission features

The life cycle of red spider mite involves five developmental stages viz. egg, larva, two nymphal stages and adult. Hot and dry conditions are congenial for increasing the population of red spider mites.

Under optimal conditions when temperature range is approximately 27°C, the red spider mite hatch within 3 days and become sexually mature in 5 days. One female can lay up to 20 eggs per day and can live for 2 to 4 weeks. Female lay hundreds of eggs at one time. This accelerated reproductive rate of red spider mite allows to accelerate its populations to adapt quickly and also increase the resistance against pesticide. These are the factors which influence the increasing incidence of red spider mite in brinjal throughout the country.

Methodology adopted for technological interventions

The studies carried out from time to time in brinjal growing areas of Dehradun under Horticulture Technology Mission Project during 2015 and 2016 envisaged that incidence of red spider mite was earlier not a problem in brinjal. However, in recent years, red spider mite has become a serious pest of brinjal and caused enormous economic loss to the growers in May to July. It was also noticed that all the hybrids and varieties of brinjal were affected severely due to incidence of red spider mite under unprotected condition.

The diagnostic survey was conducted in various parts of brinjal growing areas of Dehradun district during 2015 and 2016. The survey and discussion was held with brinjal farmers to find out their practical difficulties in obtaining maximum yield from their brinjal crops. From the survey, incidence of red spider mite emerged out as one of the major constraints in production of brinjal. Besides, most of the farmers were not aware about the quality and effective acaricides in the area which resulted in high incidence of red spider mite. The observations on varieties, hybrids, incidence of red spider mite, judicious use of chemical pesticides, their time of application, pest monitoring, nursery raising etc were recorded during group discussion with farmers. It was found that majority of the brinjal

Table 1. Impact of acaricides on incidence of spider mite and its effect on production and profitability of brinjal variety Chaya on farmer's field

Year	Period	Average incidence of spider mite on farmer's field (%)	Expenditure incurred on acaricides and their spraying (₹/ha)	Peak period of incidence of Spider mite	Average yield loss due to incidence of Spider mite (%)	Average loss in yield due to incidence of spider mite (₹/ha)	Average loss in income due to incidence of spider mite (₹/ha)	Average sale price (₹/Q)
2017	March to October	82.46	3450	June-July	67.35	336.75	336750	1000
2018	March to October	77.32	3780	June-July	64.70	323.50	323500	1000
2019	March to October	71.25	3370	June-July	63.26	316.30	316300	1000

farmers were not aware about the symptoms of red spider mite and its incidence. Farmers were applying quinalphos, cypermethrin, profenophos insecticides but these chemicals did not provide any relief from the menace of red spider mite. Accordingly, to mobilize the farmers towards innovative technological intervention's in brinjal for effective management of red spider mite, trainings and demonstrations were organized in Bhimawala village of Vikasnagar block of Dehradun district during 2017 to 2019. The sites were also selected for conducting demonstrations during training of the farmers. The following points emerged out during baseline survey and discussion held with the growers.

- The prevailing agro-climatic conditions in the district of Dehradun was very conducive for commercial brinjal cultivation particularly during February-March to September-October.
- Some farmers involved in brinjal cultivation were not getting remunerative price and good productivity from their crops due to lack of knowledge on incidence of red spider mite.
- Keeping in view the enormous potential and increasing demand of brinjal particularly during summer and early rainy season in the market, action plan was formulated to mobilize and sensitize the farmers.
- Accordingly, diagnostic survey was undertaken in which meeting and survey were organized in the potential areas of the farmers to find out their views on commercial brinjal production. Most of the farmers told that they were willing for brinjal farming but due to lack of knowledge and poor productivity obtained by some farmers owing to incidence of red spider mite, they were helpless.
- After conducting diagnostic survey, encouraging attitude of the farmers and seeing the potential, training and demonstrations conducted during 2017 to 2019 gave tremendous impact on the farming community within very short span of time.
- Three application of acaricides namely hexythiazox 1ml per liter of water + propargite 1ml per liter of water + Sticker 0.5 ml per liter of water at 10 days interval were done. First spraying was started on seeing the symptoms of red spider mite. For observing the incidence of red spider mite, crop monitoring at regular interval was followed with the help of farmers.

Before Interventions

- Farmers were using quinalphos, cypermethrin, profenophos insecticides for management of red spider mite as they were of the opinion that the incidence of red spider mite was due to insect.
- The data recorded on farmers field revealed that average incidence of red spider mite was 82.46%, 77.32% and 71.25%, respectively during 2017, 2018 and 2019. It shows that incidence of red spider mite was very serious and application of insecticides did not work. It is also important to mention that farmers were growing Chaya and Shamli hybrids of brinjal but despite of that they were not getting optimum yield from their brinjal crop.
- The average loss observed in yield was 336.75 q/ha in 2017, 323.50 q/ha during 2018 while it was 316.30 q/ha in 2019. Similarly, average loss in income due to incidence of red spider mite was recorded as ₹ 336750, ₹ 323500 and ₹ 316300/ha, respectively during 2017, 2018 and 2019.
- Realizing the increasing incidence of red spider mite in brinjal and losses caused in yield and income, technological interventions were made in which demonstrations were carried out on farmers fields at Bhimawala village of Vikasnagar block of Dehradun district and farm of Krishi Vigyan Kendra, Dhakrani, Dehradun during 2017 to 2019 with farmers in participatory mode.

After Interventions

- The technological interventions on management of red spider mite in brinjal crops were demonstrated on farmers field and KVK, Farm of Dehradun in which three application of acaricides namely hexythiazox 1ml per liter of water + propargite 1ml per liter of water + Sticker 0.5 ml per liter of water at 10 days interval were done. In order to observe the incidence of red spider mite, crop monitoring at regular interval was done by the farmers and scientists.
- The first spraying was started 70 days after transplanting when symptom's of red spider mite was seen. After that, second and third sprayings were given at 10 days interval by keeping in view the incidence of red spider mite during crop monitoring.
- It was observed that three sprayings of above acaricides gave effective management of red spider

Table 2. Impact of acaricides on incidence of spider mite and its effect on production and profitability of brinjal variety Chaya on demonstrated crop

Year	Period	Average incidence of spider mite on demonstrated crop (%)	Expenditure incurred on acaricides and their spraying + Other management practices (₹/ha)	Peak period of incidence of Spider mite	Average yield due to management of Spider mite (Q/ha)	Gross income due to management of spider mite (₹/ha)	Net income due to management of spider mite (₹/ha)	Average sale price (₹/Q)	B:C Ratio
2017	March to October	2.66	12400+82500 = 94900	June-July	504.75	504750	409850	1000	5.31
2018	March to October	2.08	13800+87800 = 101600	June-July	512.38	512380	410780	1000	5.04
2019	March to October	1.68	15600+91200 = 106800	June-July	518.55	518550	411750	1000	4.85

mite due to which the average loss was 2.66% in 2017, 2.08% during 2018 whereas it was 1.68% in 2019. The average incidence of red spider mite in the demonstrated brinjal crop indicated that both the acaricides worked extremely well against red spider mite in all the three years.

- The average yield was also recorded by pooling all the pickings which revealed that maximum yield i.e. 518.55 q/ha in 2019 followed by 512.38 q/ha during 2018 and 504.75 q/ha in 2017. The data on yield shows that three application of mentioned acaricides exhibited outstanding performance in effective management of red spider mite and enhancement in yield.
- The data taken after every sale of brinjal were pooled and average income was calculated. The observations on income manifested that it was highest during 2019 which was ₹411750/ha closely followed by 2018 and

2017 in which ₹410780/ ha and ₹409850/ ha earned, respectively.

Future Prospects

This intervention is very promising for effective management of red spider mite and to maximize the productivity and income of the farmers. The acaricides found effective in management of red spider mite in brinjal in Dehradun region of Uttarakhand have great significance in national perspective because brinjal is such a vegetable which is grown around the year throughout the country and incidence of red spider mite has emerged as most devastating pest. Hence, in the present scenario of brinjal cultivation, management of red spider mite has become very challenging for the farmers in which recommendation investigated in the studies and highlighted in the paper will help the farming community in effective, economical and environmental management of red spider mite.



Incidence of red spider mite in brinjal



Close view of red spider mite



Damaged crop before intervention



Same damaged crop after intervention



Scientist and field worker monitoring the crop



Brinjal production in demonstrated crop

SUMMARY

The impact of technological interventions particularly introduction of Chaya and Shamli hybrids, management of red spider mite by timely and judicious application of acaricides namely hexythiazox 1ml per liter of water + propargite 1ml per liter of water+ Sticker 0.5 ml per liter of water at 10 days interval in brinjal crops significantly improved the production, productivity, profitability and sustainability in agri-horticultural production systems in Vikasnagar block of Dehradun district of Uttarakhand. The survey, trainings and demonstrations conducted during 2015 to 2019 encouraged the farmers towards commercial brinjal cultivation. According to an estimate, about 70% increment in yield was recorded under brinjal cultivation which is remarkable impact achieved due to

technological intervention particularly introduction of high yielding hybrids and effective management of red spider mite.

The incidence of red spider mite was very low in brinjal crop sprayed with hexythiazox + propargite as hexythiazox has ovicidal action and propargite has adulticidal action hence, combination of both the acaricides have managed the menace of red spider mite very significantly.

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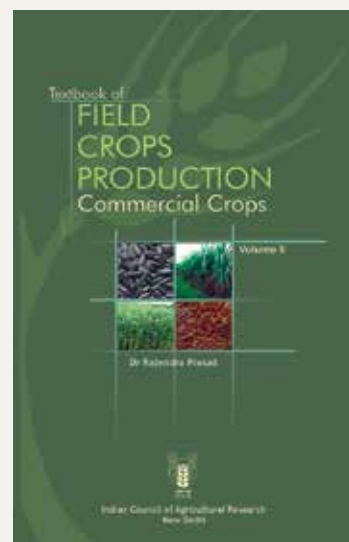
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