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Incidence of insect pests on radish with different dates of sowing in Meghalaya

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ABSTRACT

The experiment was conducted at Entomology Research Field, Division of Crop Science, ICAR Research Complex for NEH Region, Umiam, Meghalaya. Radish (Var: Japani white long) was sown with five different sowing dates starting from 15th October with 15 days intervals up to 15th December. The experiment was laid out in randomized block design (RBD) with four replications. Weekly observations were taken from randomly selected 5 tagged plants/plot for incidence of insect pests on radish from each sowing. Results revealed that population of striped flea beetle and crucifer flea beetle increased with successive sowing dates. Minimum population of striped flea beetle and crucifer flea beetle were noticed in first sowing with 2.90±0.74 and 0.31±0.06 beetles/plant, respectively whereas maximum population was recorded in fifth sowing with 8.95±2.26 and 4.94±1.04 beetles/plant, respectively. Maximum population of leaf beetle was recorded in first sowing with 0.13±0.01 whereas no population was found in fifth sowing. Minimum population of aphid was observed in first sowing with 1.82±0.98 aphids/leaf and highest population was noticed in fourth date of sowing with 4.87±1.89 aphids/leaf. Incidence of cabbage butterfly in different sowing of radish was non-significant. Maximum population of mustard sawfly larvae was noticed in third sowing with 0.21±0.13 larvae/plant whereas no incidence was recorded on radish in fifth sowing. Highest marketable yield was recorded in first sowing with leaves (266.53 q/ha) and without leaves (188.65q/ha) followed by second sowing with leaves (264.60q/ha) and without leaves (185.21q/ha).

1. Introduction

Among the vegetables, crucifers are well known around the world as significant vegetable crops that are essential for both the rich and the poor on a daily basis. Cruciferous vegetables, such as radish (*Raphanus sativus* L.), cabbage (*Brassica oleracea* var. capitata), cauliflower (*Brassica oleracea* var. botrytis), turnips (*Brassica rapa*), knol-khol (*Brassica oleracea* var. caulorapa), and mustard (*Brassica juncea*) are excellent sources of vitamins, minerals (Mhaske, 2008). Radish (*Raphanus sativus* L.) is one of the most popular cruciferous vegetables. In India, it is frequently referred to as *mooli* (Hindi) and is regarded as one of the most important vegetables in Asia. It is a popular root vegetable in both tropical and temperate regions. In many tropical nations, it is a staple vegetable that has been utilized in a variety of culinary ways since antiquity. It has gained popularity because of its wide use and high nutritive value, as it is an excellent source of carbohydrates, protein and Vitamins A&C (Bakhsh *et al*., 2006). Radish plants (roots, leaves and seeds) have many medical uses, including treatment of tuberculosis, whooping cough, asthma attacks, laxative to treat constipation, fracture of kidney and bladder stones, thinner, cholesterol-lowering, antiradical and analgesic pain (joint medical problems affecting the joints and textile) (Gutierrez and Perez, 2004). In India, total area under radish production is 0.209 million hectares with total

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production of 3.06 million tonnes and productivity 14.65 t ha^{1}. State wise West Bengal is highest in area and production of radish in the country followed by Haryana, Punjab, Bihar, Chhattisgarh, Assam, Uttar Pradesh and Odisha. Whereas, Punjab recorded with highest productivity of radish in India (Anonymous, 2018). In Meghalaya, radish covers an area of 1563 ha, production of 30166 metric ton, and yield of 19.3 t ha^{-1} (Anonymous, 2019). The radish crop suffers and causes heavy losses from the ravages of different insect pests both in seedling and vegetative stages. The major insect pest that attack radish in India are aphids (*Brevicoryne brassicae*, *Lipaphis erysimi*, *Myzus persicae* and *Toxoptera aurantii*), flea-beetles (*Phyllotreta chotanica* Duv. *Chaetocnema basalis* and *Monolepta signata*) and sawfly (*Athalia lugens proxima)* (Uma and Manjunatha, 2020). While *Thrips tabaci*, *Crocidolomia pavonana*, *Hellula undalis*, *Spilosoma obliqua* and *Spodoptera litura* are reported to be the minor pests of radish (Butani and Juneja, 1984). Among the various insect pests infesting radish, flea beetle is considered as the most serious pest of radish from seedling to harvesting. An average of 8.0 flea beetles (*Phyllotreta downsei*) per plant was found to be feeding on radish leaves (Parsad, 2002). An average of 63.02% leaf infestation and 53.96% root infestation in radish by flea beetle was reported (Anooj *et al.,* 2020), while mustard sawfly *(Athalia lugens proxima)* is most serious pest mostly observed at seedling stage. Its incidence was recorded as high as 85% on radish crop (Srivastava *et al*., 1972). To manage these insect pests on radish, indiscriminate use of conventional pesticides has resulted in development of several problems like environmental pollution, insecticide resistance, pest resurgence, residual toxicity, health hazards and destruction of beneficial organisms, flora and fauna. Therefore, development of alternatives to synthetic chemicals for ecofriendly management of insect pests is need of the hour. Manipulation of date of sowing of any crop may be one of the options to escape the heavy infestation of insect pests. Considering these views in mind, the present experiment was conducted to evaluate the different sowing dates of radish under Meghalaya condition.

2. Materials and methods

The experiment was conducted at Entomology Research Farm, ICAR Research Complex for NEH Region, Umiam, Meghalaya. Radish (Var: Japani white long) was sown with five different sowing dates starting from 15th October with 15 days intervals up to 15th December, 2022 under field condition. The experiment was laid out in randomized block design (RBD) with four replications. Crop was sown in 12 m^2 areas with 40cm x 10cm spacing. The common agronomic management practices were followed except plant protection for raising the crop. Weekly observations were taken from randomly selected 5 tagged plants/plot for incidence of insect pests on radish from each sowing. The mean data of all observations of insect pests were converted into square root $\sqrt{(x+0.5)}$ transformation for statistical analysis. Weekly weather data (Figure 1) regarding average temperature, average relative humidity and rainfall of the whole cropping season from sowing till harvest were collected from the Division of System Research and Engineering, ICAR Research Complex for NEH Region, Umiam, Meghalaya. Harvesting of radish was done at mature stages when attained proper size. Weights of the harvested radish were recorded from each plot with leaves and without leaves.

3. Results and discussion

Incidence of insect pests in radish with different dates of sowing

Incidence of insect pests in radish with different dates of sowing is presented in Table 1 and Figure 2. The occurrence of coleopteran insects, such as the striped flea beetle (*Phyllotreta striolata* Fab.), crucifer flea beetle (*Phyllotreta cruciferae* Goeze) and leaf beetle (*Monolepta signata* Olivier) were found on radish in all the dates of sowing. Numbers of beetle population/plant were significantly different among the different dates of sowing. It was observed that population of striped flea beetle and crucifer flea beetle increased with successive sowing dates. Minimum average population of striped flea beetle and crucifer flea beetle were noticed in first sowing with 2.90±0.74 and 0.31±0.06 beetles/plant, respectively whereas maximum population was recorded in fifth sowing with 8.95±2.26 and 4.94±1.04 beetles/plant (Figure 2), respectively. In case of leaf beetle, fluctuating trend of population in different sowing dates was observed. Maximum average population of leaf beetle was recorded in first sowing with 0.13±0.01 whereas no population was found in fifth sowing (Figure 2). The incidence of sucking insect i.e. aphid (*Lipaphis erysimi* Kalt) was recorded on radish in all dates of sowing. Minimum average population of aphid was observed in first sowing with 1.82±0.98 aphids/leaf and highest average population was noticed in fourth date of sowing with 4.87±1.89 aphids/leaf (Table 1). Incidence of cabbage butterfly (*Pieris brassicae* Lin.) in different sowing of radish was non-significant. Average number of larvae/plant of cabbage butterfly was minimum in second sowing (0.09±0.03 larvae/plant) and maximum was in fifth sowing (0.30±0.23 larvae/plant) (Table 1). Incidence of mustard sawfly (*Athalia lugens proxima* Klug) was not found on radish in all sowing dates. Maximum average population was noticed in third sowing with 0.21±0.13 larvae/plant whereas no incidence was recorded on radish in fifth sowing (Table 1).

Yield of radish on different dates of sowing

Yield of radish of different sowing is presented in Figure 3. Yield of radish was significantly different among the different sowing dates. Highest marketable yield was recorded in first sowing with leaves (266.53 q/ha) and without leaves (188.65q/ha) followed by second sowing with leaves (264.60q/ha) and without leaves (185.21q/ha) and third sowing with leaves (249.97q/ha) & without leaves (179.00q/ha) while the fourth sowing (with leaves 238.53q/ha & without leaves 166.36q/ha) and fifth sowing (with leaves 230.70q/ha & without leaves 157.38q/ha) recorded comparatively lower yield of radish.

The results showed that, among the five sowing dates, the first and second sowing showed the lower infestation with two major coleopteran beetles (striped flea beetle and crucifer flea beetle) whereas the third, fourth and fifth sowing recorded comparative higher infestation. Literatures on incidence of insect pests of radish with different date of sowing are scanty. Therefore, the present findings may be compared with other related crops sown with different dates. The present findings are in conformity with the results of Patel *et al*. (2017) who reported that the incidence of flea beetle on various *brassica* species was found minimum in early sowing i.e. first, second and third, and maximum population in late sown crop i.e. fourth and fifth sowing. Joshi *et al.* (1989) reported that crops sown in September-October escaped aphid (*Lipaphis erysimi*) infestation while crops sown in November-December were heavily infested with the aphid and caused heavy yield loss. Our findings may be paralleled with the results of Singh *et al.* (2006) who reported that sawfly recorded highest numbers in early sown as compared to the late sown crop and there was statistically no significant difference in infestation between the early and late sown mustard crop. Mean population of cabbage aphid (*Brevicoryne brassicae* L.) were less in early planted crops compared to late planted crops (Patra *et al.*, 2012). Saeed and Razaq (2014) reported that early sown canola (mid-October) had significantly lowest numbers of key aphids when compared to late sown crops (early to mid-November). The present findings are in agreement with the results of Gupta and Agarwal (2006) who reported that the population of *Lipaphis erysimi* and *A. proxima* Klug, was minimum in mustard sown on October and maximum in November.

4. Conclusion

Among the five different dates of sowing, first and second sowing recorded less infestation of insect pests as well as recorded highest yield of radish as compared to other dates of sowing. Therefore, it is concluded that radish may be sown during mid-October to mid-November to escape the heavy infestation of insect pests under Meghalaya condition.

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6. References

Anonymous (2018) Indian Horticulture Database, National Horticulture Board. https://nhb.gov.in/statistics/State_Level/2017-18. Accessed on 10 January 2023.

Anonymous (2019) Directorate of Economics and Statistics, Government of Meghalaya. Area Production and Yield of Principal Crops 2019.pdf (megplanning.gov.in). Accessed on 8 February 2023.

Anooj SS, Raghavendra KV, Shashank, PR Nithya C, Sardana HR, and Vaibhav, V (2020) An emerging pest of radish, striped flea beetle *Phyllotreta striolata* (Fabricius), from Northern India: incidence, diagnosis and molecular analysis. Phytoparasitica 48(5): 743-753.

Bakhsh K, Ahmad B, Gill ZA, and Hassan S (2006) Estimating indicators of higher yield in radish cultivation. International Journal of Agricultural. Biology 8(6): 783-787.

Butani DK, and Juneja SS (1984) Pests of radish in India and their control. Pesticides 18(5): 10-12.

Gupta RK, and Agrawal N (2006) Management of mustard aphid, *Lipaphis erysimi* Kalt. and mustard sawfly, *Athalia lugens proxima* Klug. through different dates of sowing in mustard. Journal of Entomological Research 30(4): 325-327.

Gutiérrez RMP, and Perez RL (2004) *Raphanus sativus* (Radish): their chemistry and biology. The Scientific World Journal 4: 811- 837.

Joshi ML, Ahuja, DB, and Mathur BN (1989) Loss in seed yield by insect pests and their occurrence on different dates of sowing in Indian mustard (*Brassica juncea* subsp. juncea). Indian Journal of Agricultural Sciences 59(3): 166-168.

Mhaske SN (2008) Studies on seasonal incidence and management of pests infesting radish, *Raphanus sativus* Linn. M.Sc. thesis, Submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India.

Patel S, Singh CP, and Yadav SK (2017) Seasonal Incidence of mustard flea beetle, *Phyllotreta cruciferae* on Brassica species in relation to weather parameters at different dates of sowing. Journal of Entomology and Zoology Studies 5(4): 673-677.

Patra S, Thakur NA, Saikia K, and Firake DM. (2012) Population dynamics of cabbage aphid, *Brevicoryne brassicae* L. on major cole crops in Meghalaya. Madras Agricultural Journal 99(7): 573-575.

Prasad K (2002) Insect pest status on summer vegetables in Malnad hilly tracts. Karnataka Journal of Agricultural Sciences 15(1): 156-157.

Saeed NA, and Razaq M (2014) Effect of sowing dates within a season on incidence and abundance of insect pests of canola crops. Pakistan Journal of Zoology 46(5).

Singh GP, Singh NN, and Singh AK (2006) Effect of sowing dates on incidence of mustard sawfly, Athelia lugens (Klug) infesting mustard. Journal of Applied Zoological Researches 17(2): 156-157.

Srivastava AS, Nigam PM, and Awasthi BK (1972) Survey of pests on mustard crop. Labdev Journal of Science and Technology 10(3): 165-166.

Uma GS, and Manjunatha M (2020) Evaluation of selected botanical insecticides against radish flea beetles (*Phyllotreta chotanica* Duv.). Journal of Entomology and Zoology Studies 8(1): 1051-1053.

Table 1. Incidence of insect pests in radish with different dates of sowing

Date of sowing	Incidence of insect pests in radish with different dates of sowing		
	Aphids (No. /leaf ± SEm)	**Cabbage butterfly (No. larvae/plant ± SEm)**	**Mustard sawfly (No. larvae/plant ± SEm)**
Sowing I (15th October)	1.82±0.98	0.15±0.06	0.08±0.03
Sowing II (30th October)	1.99±1.07	0.09±0.03	0.09±0.04
Sowing III (15th November)	1.95±0.54	0.24±0.18	0.21±0.13
Sowing IV (30th November)	4.87±1.89	0.26±0.24	0.11±0.07
Sowing V (15th December)	3.80±1.80	0.30±0.23	0.00±0.00
SEm (±)	0.079	-	0.012
CD (P=0.05)	0.244	NS	0.037

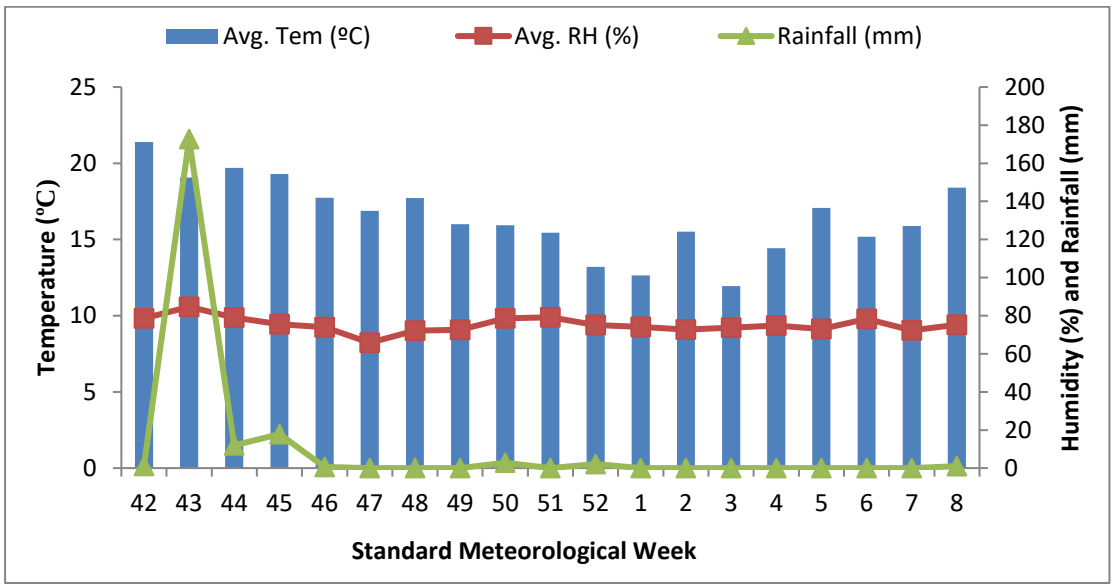

Figure 1. Average weather parameters prevailed during study period of 2022-2023

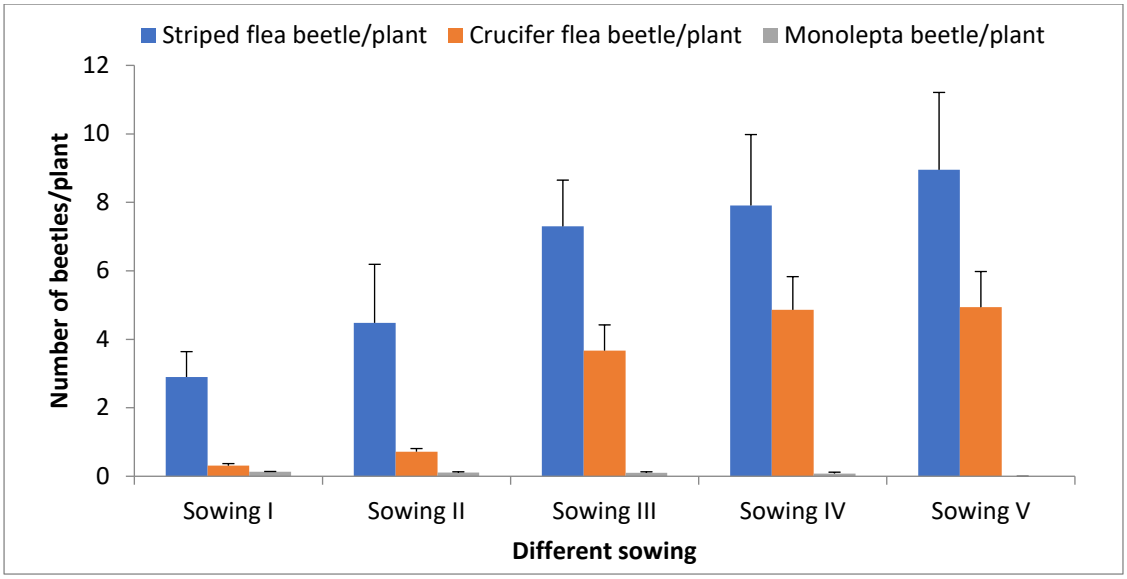

Figure 2. Incidence of beetles on radish with different sowing

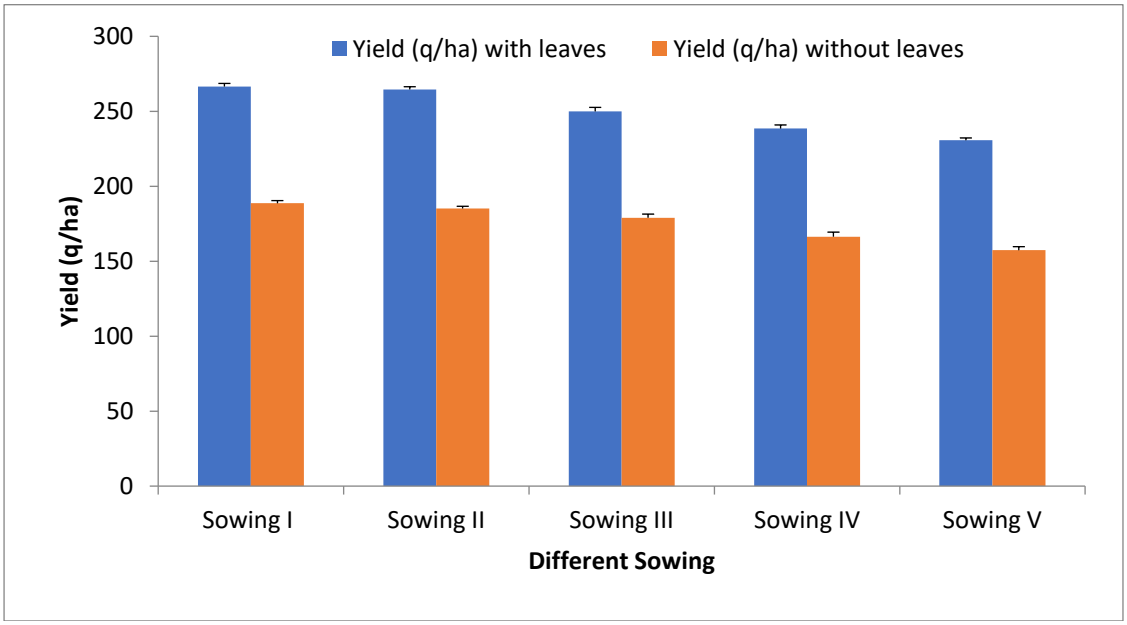

Figure 3. Yield of radish with different sowing