

SURVEY ON PESTS AND DISEASES OF CABBAGE*

U. JAWAHARA RAJU and K. SIVAPRAKASAM

Centre for Plant Protection Studies,
Tamil Nadu Agricultural University, Coimbatore-641 003.

ABSTRACT

Survey on cabbage in 40 villages in the Nilgiris district of Tamil Nadu revealed the severity of the diamond back moth, *Plutella xylostella*, the cutworm, *Agrotis ipsilon*, the semilooper, *Trichoplusia ni*, the aphid, *Lipaphis erysimi*, the club root, *Plasmodiophora brassicae*, the black rot, *Xanthomonas campestris* pv. *campestris*, and the white rot, *Sclerotinia sclerotiorum* and their importance as key pests and diseases. The larval parasitoid *Apanteles plutellae* on diamond backmoth and the predatory coccinellid beetle, *Menochilus sexmaculatus* on the aphid were the predominant biocontrol agents in the cabbage ecosystem in the Nilgiris district of Tamil Nadu.

Keywords : Survey, Cabbage, Pests, Diseases, Natural enemies of pests

Cabbage, *Brassica oleracea* var. *capitata* (L.) is one of the most popular cruciferous vegetables grown throughout India and it is one of the richest sources of energy. Currently in Tamil Nadu, it is grown in an area of 1,770 ha in different districts both under rainfed and irrigated conditions (Anonymous, 1987). A survey was undertaken during February to June, 1988 in the Nilgiris district of Tamil Nadu to assess the occurrence of pests and diseases as well as natural enemies of pests on cabbage and the results of the survey are presented in this paper.

MATERIALS AND METHODS

A survey was conducted from February 1988 to June 1988 at weekly intervals in Udthagamandalam, Coonoor, Kothagiri and Gudalur taluks of the Nilgiris district on cabbage at different stages of the crop viz., vegetative (from 15 to 45-day old), pre-heading (from 46 to 75-day old) and

heading (from 76 to 120-day old) in 40 villages to study the following aspects, viz., (i) the seasonal incidence of diamond back moth, aphid, green semilooper and cutworm; (ii) the seasonal incidence of club root, black rot, ring spot, white rot, *Alternaria* leaf spot and downy mildew diseases and (iii) the occurrence of natural enemies of pests.

During the survey, observations on the incidence of pests and their natural enemies and diseases were recorded. The larvae and pupae were collected and reared *in vitro* to record the occurrence of natural enemies.

Method of assessment of pests and diseases

PESTS :

a) Diamond backmoth (*Plutella xylostella* L.)

Ten plants were selected at random in each of the selected fields and the number of larvae on the three

* A part of M.Sc. (Ag.) thesis of senior author approved by Tamil Nadu Agricultural University, Coimbatore-3

opened inner leaves in each plant was recorded.

b) Aphid (*Lipaphis erysimi* Kalt.)

The total number of nymphs and adults of the aphid was counted and recorded from the three leaves immediately following the primordium from 10 selected plants and the mean population per plant was arrived at.

c) Green semilooper (*Trichoplusia ni* Hubner).

Ten plants were selected at random in each field. The number of larvae in each plant was recorded.

d) Cutworm (*Agrotis ipsilon* Rott.)

One hundred plants were examined in each of the selected fields and the number of plants affected by larvae was recorded.

Natural enemies of pests

a) Larval parasitoid (*Apanteles pluteellae* Kurd.)

From each field, 10 plants were selected. The number of unopened cocoons of the parasitoid and parasitised larvae was counted.

b) Predatory coccinellid beetle (*Melanochilus sexmaculatus* Fabricius)

Ten plants were selected at random in each of the selected fields and the total number of the adult beetles was recorded.

DISEASES :

a. Clubroot (*Plasmodiophora brassicae* Wor.)

One hundred plants were examined in each of the selected fields and the number of infected plants was recorded and expressed as per cent disease incidence.

b. Black rot (*Xanthomonas campestris* pv. *campestris* (Pam.) Dows)

c. Alternaria leafspot (*Alternaria brassicae* (Berk.) Sacc.)

d. Ring spot (*Mycosphaerella brassicicola* (Fr.) Lindau.)

These three diseases were recorded on 10 randomly selected plants in each field by grading the three opened inner leaves in each of the plants on a scale of 1-9 (Jayaraj *et al.*, 1987).

e. White rot (*Sclerotinia sclerotiorum* (Lib.) de Bary)

One hundred plants were examined in each of the selected fields and the number of infected plants was recorded and expressed as per cent disease incidence.

f. Downy mildew (*Peronospora parasitica* (Pers.) de Bary)

The disease was graded on 0 to 5 scale (Gupta and Basuchoudhary, 1987) from 10 selected plants in each field. The percentage disease incidence was calculated for black rot, *Alternaria* leaf spot, ring spot and downy mildew diseases by using a method of Wheeler (1969).

RESULTS AND DISCUSSION

Diamond backmoth, *Plutella xylostella*

In the present study, an intensive survey showed the occurrence of *P. xylostella* to be widespread in the Nilgiris district of Tamil Nadu. The population was low (1.07) during vegetative stage and it increased significantly in the pre-heading (1.85) and heading stages (2.07). This increase was earlier attributed to the completion of more than one generation between vegetative pre-heading and heading stages (Chelliah and Srinivasan, 1986). The present observations

are in agreement with that of Sachan and Srivastava (1972) who have also reported that the population of *P. xylostella* was meagre in the beginning but by about the maturity of crop, the pest occurrence was abundant

Cutworm, *Agrotis ipsilon*

In the present study, the prevalence of pest was observed during the entire survey period in Nilgiris district and the mean damage was maximum in the vegetative stage, (11.3) and it declined significantly in the pre-heading (7.2) and heading stages (2.2 per cent). Delobel and Gutierrez (1981) observed severe attack of *A. ipsilon* in the early stages of crop because of its succulent nature, and it gradually declined with the maturity of the crop. The present study is in agreement with the findings of Prasad *et al.* (1986) who have reported a very high incidence in seedling and very low incidence of cutworm in later stages of pea crop.

Green semilooper, *Trichoplusia ni*

In the present study, the pest population was low during vegetative stage (0.27) and it increased significantly during pre-heading (1.23) and heading stages (1.91). Reid and Bare (1952) have reported that the incidence of *T. ni* was low in early stage of the crop and it was high as the crop matured.

Aphid, *Lipaphis erysimi*

The incidence of the aphid was observed on cabbage in all the 40 villages surveyed. The mean population of the aphid increased significantly as the crop advanced from vegetative (32.27) to pre-heading (57.88) and heading stages (74.77). This finding is in agreement with that of Wolfenbarger (1967), Chandra and Kushwaha

(1986) and Jusoh and Norton (1987) who have also reported that the incidence of *L. erysimi* was relatively less during the early stages than the later stages of the crop growth.

Larval parasitoid, *Apanteles plutellae*

In the present study, the population of *A. plutellae* was low (0.66) during vegetative stage and the population was found to increase (1.21) during pre-heading stage. In the heading stage, the population of the parasitoid was maximum (1.36) per plant and this was related to the abundance of its host *viz.*, *P. xylostella* in advanced stages of the crop. Chin (1974) reported that *A. plutellae* occurred in greater numbers in later stages of crop than in early stages.

Predatory coccinellid beetle, *Meno-chilus sexmaculatus*

The population of predatory coccinellid beetle was found to be high (0.35) during vegetative stage and it decreased in pre-heading (0.27) and heading stages (0.14). This finding is in agreement with the observations of Joshi and Sharma (1973) who found more number of predatory coccinellid beetles in vegetative stage than the later stages of mustard crop.

Club root, *Plasmodiophora brassicae*

The incidence of club root disease was prevalent in 38 out of 40 villages surveyed and disease incidence was low (0.21) during vegetative stage and it increased significantly during pre-heading (9.82) and heading stages (17.6 per cent) which was in consonance with the findings of Reyes (1969) who have reported a severe incidence of club root disease in later stages of the crop growth than the early stages.

Black rot, *Xanthomonas campestris*, pv. *campestris*

The incidence of black rot was noticed in the crop in 39 out of 40 villages during the survey. The disease incidence was low (7.81) during vegetative stage and it increased significantly during pre-heading (31.80) and heading stages (51.18 per cent). The above finding in the present study is in accordance with the earlier findings of Williams (1980) who observed that the cabbage crop was most vulnerable to infection during late flowering and seed maturation stages. He further observed that the temperature was most favourable for bacterial growth during these two stages of the crop.

Alternaria leaf spot, *Alternaria brassicae*

In the present study, the disease was recorded in 18 out of 40 villages surveyed. The disease incidence was low (2.99) in vegetative stage and it increased significantly during pre-heading (8.32) and heading stages (15.33 per cent). Similar observations were also made by Reyes (1959).

Ring spot, *Mycosphaerella brassicicola*

The occurrence of ring spot was observed in 17 out of 40 villages surveyed. The disease incidence was low (4.23) in vegetative stage and it increased significantly during pre-heading (14.28) and heading stages (24.67 per cent). Hartill and Sutton (1980) have reported that younger leaves were free of ring spot disease because of the presence of more vola-

tile toxic compounds and the older leaves become extensively spotted.

White rot, *Sclerotinia sclerotiorum*:

In the present study, the incidence of white rot was noticed on the crop in 36 out of 40 villages surveyed. The disease incidence was 7.18 in pre-heading stage and it significantly increased in heading stage with 14.49 per cent whereas in vegetative stage the incidence was not observed. Similar trend on the occurrence of disease was reported by Saxena and Rai (1987) who attributed that the high disease incidence during later stage of the crop might be due to the dense canopy resulted out of thick planting. Epidemics of white mold due to the same fungus *viz.* *S. sclerotiorum* was noticed on beans only after flowering. However, a few infected plants have been observed occasionally in fields prior to blossoming, whereas young plants, were free from infection (Purdy, 1958; Abawi and Grogan, 1975).

Downy mildew, *Peronospora parasitica*

The downy mildew incidence was recorded in 18 villages with the maximum of 54.87 per cent. The disease incidence was not significantly different in vegetative, pre-heading and heading stages respectively. Gupta and Basuchoudhary (1987) have first reported downy mildew disease on cabbage in India and they observed the severe incidence in nursery as well as main fields.

REFERENCES

- Abawi, G.S. and Grogan R.G., 1975. Source of primary inoculum and effects of temperature and moisture on infection of beans by *Whetzelinia sclerotiorum*. *Phytopathology* 65 : 300-309.
- Anonymous. 1987. Season and crop report of Tamil Nadu. Issued by the Commissioner of Statistics, Government of Tamil Nadu. 177 pp.
- Chandra, S. and Kushwaha, K.S. 1986. Impact of environmental resistance on aphid complex of cruciferous crops under the agronomic conditions of Udaipur 1. abiotic components: *Indian J. Entomol.* 48 : 495-514.
- Chelliah, S. and Srinivasan, K. 1986. Bioecology and management of diamond back moth in India: In : *Diamond back moth management, Proceedings of the First International workshop*, 11-15 March, 1985. AVRDC: Taiwan. pp. 63-76.
- Chin, T. 1974. Studies on seasonal appearance of diamond back moth in relation to environmental factors. *Taiwan Agric. Quart.* 10 : 81-84
- *Delobel, A. and Gutierrez, 1981. Fluctuations in the catches of Lepidoptera in light traps in the course of a year in a biotype in New Caledonia. *Cahiers Orstan Serie Biologie.* 44 : 23-24.
- Gupta, D.K. and Basu Chaudhury, K.C. 1987. *Brassica oleracea* var. *capitata*, A new host of *Pernospora parasitica* (Pers.) de Bary. *Int. J. Tropical Plant Dis.* 5 : 219-223.
- Hartill, W.F.T. and Sutton, P.G., 1980. Inhibition of germination of *Mycosphaerella brassicicola* ascospores on young cabbage and cauliflower leaves. *Ann. Appl. Biol.* 96 : 153-161.
- Jayaraj, S., Rangarajan A.V., Sundara Babu P.C., Jeyarajan R., Sivaprakasam K. and Sivagami Vadivelu. 1987. Collaborative programme on Pest and Disease Surveillance on Horticultural crops : TNAU Offset and Printing Press, Coimbatore. 30 pp.
- Joshi, F.L. and Sharma J.C. 1973. Efficacy of different insecticidal treatment schedules against the pests of cabbage: *Labdev. J. Sci. & Tech.* 11 : 1-5.
- Jusoh, M.M. and Norton G.A. 1987. Cabbage aphid control on commercial farms in the Thames Valley, U.K. *Crop Protection* 6 : 379-387.
- Prasad, D., Singh K.M., Katiyar R.N. and Singh R.N. 1986. Effect of insecticides on the plant growth, pest incidence and crop yield of pea, *Pisum sativum* Linn. *Indian J. Entomol.* 48 : 478-494.
- Purdy, L. H. 1952. Some factors affecting penetration and infection of *Sclerotinia sclerotiorum*. *Phytopathology* 48 : 605-609.
- Reid, W. J. Jr. and Bare, C. O. 1952. Seasonal populations of cabbage caterpillars in the Charleston, S. C. Area. *J. Econ. Entomol.* 45 : 695-699.
- Reyes, A. A. 1969. The seasonal occurrence of fungal and bacterial diseases of crucifers in Ontario in 1967 and 1968. *Can. Pl. Dis. Surv.* 49 : 56-57.
- Sachan, J. N. and Srivastava, B. P. 1972. Studies on the seasonal incidence of insect pests of cabbage. *Indian J. Entomol.* 34 : 123-129.
- Saxena, V. C. and Rai, J. N. 1987. Survey of occurrence of white rot of crucifers caused by *Sclerotinia sclerotiorum* in Uttar Pradesh and Bihar. *Indian J. Mycol. Pl. Pathol.* 17: 89-91.