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A List of Insect Pests Infesting Barley and Oats in Karnataka

Barley (*Hordeum vulgare* Linn.) and oats (*Avena sativa* Linn.) are the minor cereal food crops of considerable importance in Northern part of India. Barley occupied an area of 2.43 million hectares with a production of 2.50 million tonnes during 1970-71 in the country. Though it was grown in a area of 2.6 thousand hectares with a production of 1.7 thousand tonnes during 1970-71 (Anon 1972) in Karnataka State, barley is an introduced crop to the Southern part of India along with oats and several varieties are under trial at the Main Research Station, Hebbal. A few reports are available indicating the occurrence of *Odontotermes obesus* R. (Mehta and Verma, 1968), *Sesamia inferens* Wlk. *Toxoptera graminum* R. and *Tanymecus indicus* Fst. on barley (Pradhan; 1969) from Northern States of the country. The crops of barley and oats are subject to the attack of several insect pests and no information is available about the species that attack these crops in Karnataka State. During the cropping seasons of 1971 and 1972 field observations were made on the incidence of pests occurring on barley and oats and their nature of damage.

The following species of insect pests on barley and oats were observed:

I. Order : Orthoptera

Family: Acrididae

1. *Chrotogonus* sp.

2. *Acrida* sp.

3. *Pyrgomorpha bispinosa* Wlk.

Nymphs and adults were found to feed on the crop along the margin of leaves and to nibble the tender ears.

II. Order : Isoptera

Family : Termitidae

4. *Odontotermes* sp.

These insects were found to attack the root system and collar region of the plants. The affected plants bearing ears were found lodging on the ground showing improper development of grains or even chaffy ears. The affected plants were easily detached from the collar region when they were pulled, whereas in case of stem borer, the affected plants were detached from the nodal region when they were pulled.

III. Order : Hemiptera

i Family : Aphididae

5. *Rhopalosiphum maidis* Fitch.

6. *Aphis craccivora* Koch.

The aphids were found feeding on the plants and unripe heads draining off the sap. In severe cases they were found literally covering the ears and other areas close to the ears.

ii Family : Cicadellidae

7. *Tettigella spectra* Distant

8. *Nephotettix virescens* Distant

Both nymphs and adults were found sucking the sap from tender portions of the plant causing pale white speckles on the affected region. In severe cases the foliage was observed drying from the tip downwards.

iii. Family : Pentatomidae

9. *Bagrada cruciferarum* Kirk.

10. *Nezara viridula* Linnaeus.

11. *Dolycoris indicus* Stal.

iv. Family : Coreidae

12. *Leptocorisa acuta* Thun.

Both nymphs and adults were found sucking the sap from tender spikelets causing chaffy grains. In case of *B. cruciferarum*, it was also found feeding on foliage resulting in clear white speckles on the affected region.

IV. Order : Lepidoptera

i. Family : Noctuidae

13. *Sesamia inferens* Wlk.

ii Family : Crambidae

14. *Chilo partellus* Swinhoe.

The caterpillars were found boring into young plants causing dead hearts and producing chaffy earheads in grown up plants.

iii. Family : Pyraustidae

15. *Cnaphalocrocis medinalis* Guenee

The larva fold the leaf, stays within and damage the blade which turn whitish and dry.

iv. Family : Hesperidae

16. *Pelopidas mathias* F.

The caterpillars were found defoliating the leaves.

V. Order : Coleoptera

i Family : Hispidae

17. *Dicladispa armigera* Olivier.

The adult beetles were noted to scrape the green matter parallel to the midrib.

ii. Family : Galerucidae

18. *Monolepta signata* Olivier.

The adults were found feeding on the upper surface of leaves, making longitudinal streaks and leaving only the lower epidermis. As a result, the leaves become skeletonised longitudinally, dried and curled upwards. In severe cases the leaves completely dried. The adults were found to prefer tender leaves, restricting themselves to the distal half portion.

iii. Family : Curculionidae

19. *Myllocerus discolor* Boheman

20. *Myllocerus viridanus* Fabricius

Adult weevils were found to damage the crop by feeding on the leaves from the margin.

Among the insect pests recorded *Sesamia inferens*, *Cnaphalocrocis medinalis*, *Nezara viridula*, *Dolycoris indicus* and the termites (*Odontotermes* sp.), are observerd to be the major pests of barley and oats in the State.

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Food Consumption during Nuclear Polyhedroses of the Red Hairy Caterpillar, *Amsacta albistriga* Walk. (Arctiidae)

A nuclear polyhedrosis virus infection was reported recently from Tamil Nadu in the groundnut red hairy caterpillar *Amsacta albistriga* Walk. (Jacob and Subramaniam, 1972). Since loss of appetite and cessation of feeding are the general symptoms observed during nuclear polyhedroses of many Lepidoptera, (Smith, 1967), the effect of NPV infection on the feeding activity of *Amsacta albistriga* was observed in the present study.

Larvae of *Amsacta albistriga* died of nuclear polyhedroses were suspended in distilled water and allowed to putrefy at room temperature for one week. The polyhedra were isolated and purified by filtration and differential centrifugation. The concentration 10^6 polyhedra per ml was fixed by serial

dilution with water. Ten larvae of 7th instar were inoculated with 10 micro-litres of the suspension by leaf disc method (Mc Ewen and Hervey, 1959) using castor (*Ricinus communis* L.) as food plant. After inoculation, both treated and control larvae were fed with virus free foliage every day. The amount of leaf eaten was measured by tracing the area fed on a graph paper for 144 hr at 24 hr intervals and expressed in sq. mm (Table1).

It is evident that there was no significant difference in the leaf area consumed during the first day by healthy and diseased larvae. Though the diseased larvae showed 16.41 per cent increase in food intake on the second day, it was not statistically significant. Progressive reduction in the feeding area was noted on the third, fourth and fifth day after inoculation, the decrease being 60.73, 93.03 and 97.97 per cent from that of healthy

TABLE 1. Effect of a nuclear polyhedrosis virus infection on the rate of feeding by *Amsacta albistriga*

Hours after inoculation	Area of leaf fed (sq. mm)			% increase or decrease from healthy
	Healthy	Diseased	Mean	
24	176.2 (13.16)	155.8 (11.77)	166.00 (12.46)	—11.57
48	184.6 (13 47)	214.9 (14.54)	199.75 (14.00)	+16.41
72	196.1 (13.98)	77.0 (8.06)	136.55 (11.02)	—60.73
96	188.0 (13.69)	13.1 (2.91)	100.55 (8.30)	—93.73
120	202.5 (14.22)	4.1 (1.53)	103.30 (7.87)	—97.97
144	203.6 (14.26)	— (0.70)	101.30 (7.48)	—100.00
Mean	191.8 (13.79)	77.4 (6.58)		—59.64

Mean of 10 observations

Figures in parentheses are transformed values

Difference between hours significant at 1 per cent probability level C. D (P = 0.05) 1.24.

Difference between healthy and diseased significant at 1 per cent probability level C. D (P=0.05) 2.17

Interaction between hours and healthy vs. diseased significant at 1 per cent level C. D (P=0.05) 2.67

larvae. Feeding ceased virtually on the sixth day. Jacob (1972) made similar observations in the case of cotton leaf worm, *Spodoptera litura* Fab., in which feeding was much reduced on the fourth day and completely stopped on the fifth day during nucleopolyhedrosis. Harper (1973) noted that cabbage looper, *Trichoplusia ni* Hub., fed very little of artificial media when infected with NPV in the early stages.

The healthy larvae of *A. albistriga* maintained steady food consumption with slight increase and decrease during the pre and post-moult period. It was also noted that the healthy larvae moulted at 72 hr after the start of the experiment but the diseased larvae never underwent moulting. The mortality period from ingestion to death was observed to vary from 8 to 10 days.

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Induction of White Eye Mutant in Cowpea (*Vigna sinensis* L. (Savi)

The note describes an induced white eyed, viable cowpea mutant isolated from a well adapted and high yielding black eyed variety. The meshed variety of cowpea is typically characterised by seeds that are bold with dark eye spot on and around the hilum region, the coat colour being white. The plant is erect to bushy in habit with its peduncle raised above the foliage. It is high yielding with a short duration of 80 days. Though the large black eye spot decides the varietal character of this material, the presence of this thick anthocyanine pigment on the pure white seed coat is not attractive and acceptable to the consumer. With a view to remove the black eye-spot and to isolate an accept-

able type, mutation was tried with an ionising gamma radiation.

Dried seeds of the meshed variety with 5.7 per cent moisture content were irradiated with gamma rays at the Co^{60} Gamma source, Division of Genetics, Indian Agricultural Research Institute. New Delhi at doses of 10, 20, 30, 40, 50, 60, 70 and 80 kR, using 100 seeds in each dose. The irradiated seeds were sown in a randomised block design with five replications using untreated seeds of the same lot as control. A minimum of ten plants for each treatment dose of M_1 were selected and raised in randomised block design in M_2 generation. In M_2 generation a number of deviants were observed.

One of the most interesting variants occured in 40 kR. This mutant while preserving all the original plant habit was devoid of all the anthocyanine pigments at the base of the petiole and tip of the pod with pure white flower petals and the large seeds devoid of the characteristic black eye. The plant type, height and the shape of the seeds were normal. This was isolated from the M_2 generation of a normal M_1 progeny with 96 per cent pollen fertility. This appeared in 10 per cent of the M_1 progenies with a proportion of 2.08 per cent in the 40 kR treatment. Under 20 kR treatment a similar mutant for white eye while preserving the pigmentation of the plant body at the axils of the leaf base and tip of the pod was isolated. This occured again in 10 per cent of the M_1 progenies with a proportion of 4.76 per cent in the 20 kr treatment. The different progenies showed macromutation of the different kinds such as chlorophyll mutations, tricotyledonous mutations, flower colour and eye colour mutations in different proportions of the M_1 progenies. It is seen that at least one mutation occured in each treatment, but the highest percentage of progenies showing mutation is found in 40 kR treatments.

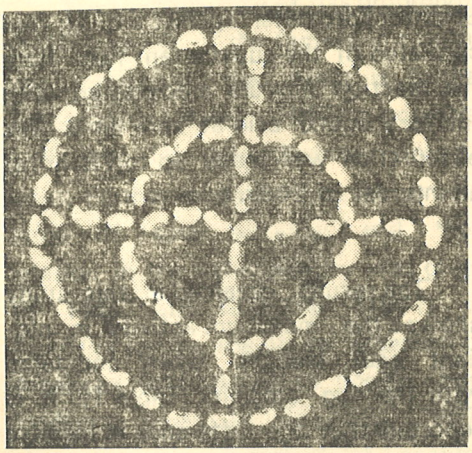
Two types of macromutants were noted. In one case the entire plant body pigmentation was affected resulting in the non pigmentation of the various plant body including seed coat. In the other the pigmentation was removed in the eye spot, while it was present in the axils of the leaf base and tip of the pod etc. It is probable that in the first

TABLE 1. Morphological deviants in M_2

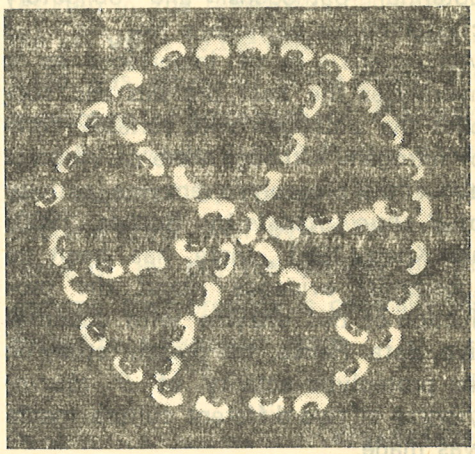
Dose kR	No. of progenies raised from M_1	Percentage of M_1 progenies showing mutation	Albino	Viridis	Tricotyledens	Violet flower	Seed coat colour	Total
Control	10	—	—	—	—	—	—	—
10	10	50	—	1.92	2.39	—	—	4.31
20	10	80	2.0	3.41	2.08	3.61	4.76	15.86
30	10	40	—	2.33	3.30	2.38	—	8.01
40	10	40	—	4.26	—	12.50	2.08	18.84

case the mutation has affected the basic gene governing the pigment production and in the second case only gene responsible for the dark eye spot on the seed coat. Moh (1969) working on beans has shown that the mutation can occur in any of the loci governing the coat colour *i.e* , the basic gene, the complementary, or the supplementry, or the modifiers, resulting in an array of colour combinations. He has indicated that a change in colour from black to self colour will have a high market value. In India, the preference is more for white coloured seeds of cow pea rather than for a type with dark spots on the hilum as in variety 'Meshed'. Though the percentage of mutant of this desirable type is low and rare it is easily identified and isolated. Breeding for such characters appear to be easily manipulated through mutations than by conventional breeding.

Selected mutants with high yield and conspicuous deviations such as violet flowered, lanceolate leaf, mottled seed with earliness were raised and



White Eye Mutant



Black Eye Cowpea

studied in M_3 for their performance and stability. The white eye mutant of the first type described was found breeding true through six generations. This mutant was crossed with the original material and the F_1 was black eyed and in F_2 a 3:1 segregation for black and white was observed. White eye of the cow pea is thus found to be recessive. This white eye mutant with a high yield on par with the original material has a consumer preference.

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