

## Pentatomid bugs reduce rice grain quality in farmers' fields in Orissa

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We surveyed farmers' fields to study insects that reduce rice grain quality in Cuttack, Puri, and Balasore Districts, Orissa. In addition to rice stink bug *Leptocorisa acuta* (Thumb.), three new species of pentatomid bugs were found in both dry and wet seasons 1987-88. The bugs were identified as *Eusarcoris ventralis* Westw., *Mendia histrio* Fabr., and *Nezara viridula* Linn. (Pentatomidae : Heteroptera) at Zoological Survey of India, New Alipur, Calcutta.

Three villages were sampled per district. Bugs were collected from insecticide-free fields by net sweeping from five randomly selected 1-m<sup>2</sup> areas in each field. Five panicles also were collected randomly from each field; infested grains were counted to calculate grain damage (see table).

Insects were found during milky, soft dough, and hard dough stages in varieties Udaya, IR36, Ratna, MW10,

### Grain damage in ricefields due to pentatomid bugs. Orissa, India, 1987-88.

| Variety | Grain damage <sup>a</sup> (%) |                    |
|---------|-------------------------------|--------------------|
|         | 1987<br>dry season            | 1988<br>dry season |
| Udaya   | 7.26 a                        | 6.86 a             |
| MW10    | 8.12 a                        | 10.24 b            |
| Ratna   | 13.23 b                       | 14.75 c            |
|         | 1987<br>wet season            | 1988<br>wet season |
| Savitri | 3.97 a                        | 2.89 a             |
| Udaya   | 2.34 a                        | 5.54 b             |
| IR36    | 3.97 a                        | 8.06 b             |

<sup>a</sup>Mean of 45 samples. Within columns and years, numbers followed by the same letter do not differ significantly.

and Savitri (CR1009). This was the first observation of *E. ventralis*, a stink bug, in India. Population densities in the dry season varied from 6.2 to 15.2 bugs (nymphs and adults)/m<sup>2</sup> in Udaya, MW10, and Ratna. In the wet season, populations varied from 1.73 to 8.54 bugs/m<sup>2</sup> in Udaya, IR36, and Savitri.

Green shield bug *N. viridula* also was found for the first time in India. Grains were infested during milky, soft dough, and hard dough stages. Population densities ranged from 5.5 to 9.6 bugs/m<sup>2</sup> during the dry season and 1.2 - 4.3 bugs/m<sup>2</sup> during the wet season. This bug was not found in Savitri.

*M. histrio*, a shield bug, was found for the first time in Orissa. It sucks the sap during the milky stage and reduces grain weight. Population densities ranged from 7.5 to 17.1/m<sup>2</sup> in the dry season and 4.9 to 14.0 bugs/m<sup>2</sup> in the wet season.

Insect populations were higher during the dry season. However, *M. histrio* predominated. Total grain damage ranged from 6.9 to 14.8% during the dry season and 2.3 to 8.1% during the wet season in different varieties. Grain damage differed significantly among varieties except in 1987 wet season. □

## Weed management

### Influence of herbicide carrier and application method on weed control

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We studied the influence of various carriers on the performance of the herbicide mixture anilofos + 2,4-D ethyl ester (EE) (0.30 + 0.51 kg/ha) in the 1988 wet season. The experiment was laid out in a randomized complete block design with four replications. Applications were with a knapsack sprayer and 625 liters water/ha; sand-mix with 50 kg river-washed sand/ha; prilled urea (PU) at 25 kg urea/ha; sprinkler bottle with herbicide volume made up to 2 liters/ha; and hand weeding twice.

Herbicides were applied 6 d after transplanting (DT). Weed dry matter (DM) was measured 60 DT.

Weed flora included *Echinochloa crus-galli*, *Cyperus difformis*, *Cyperus iria*, *Marsilea quadrifolia*, *Ammannia baccifera*, and *Eclipta rostrata*.

Broadcast sand-mixed herbicide resulted in the least weed DM; PU as a herbicide carrier was equally effective (see table). (Using PU could reduce N

### Effect of herbicide carrier on weed dry matter production and rice grain yield.<sup>a</sup> Coimbatore, India.

| Treatment <sup>b</sup>                 | Weed DM at 60 DT (g/m <sup>2</sup> ) | Grain yield (t/ha) |
|--|--------------------------------------|--------------------|
| Knapsack sprayer (625 liters water/ha) | 9.5 b                                | 5.4 a              |
| Sand mix (50 kg sand/ha)               | 6.5 a                                | 5.4 a              |
| Prilled urea (25 kg/ha)                | 7.8 ab                               | 5.4 a              |
| Sprinkler bottle                       | 9.6 b                                | 5.3 ab             |
| Hand weeding twice (20 and 40 DT)      | 12.5 c                               | 5.2 b              |

<sup>a</sup>In a column, means followed by the same letter are not significantly different at 5% level.

<sup>b</sup>The herbicide mixture consisted of anilofos at 0.30 kg/ha and 2,4-D EE at 0.51 kg/ha.

application, provided the herbicide and N application method do not cause excessive N losses.) Applying herbicide with the knapsack sprayer or sprinkler bottle resulted in higher weed DM, but significantly less than with hand weeding.

Grain yields were similar for all herbicide carrier treatments but were significantly lower with hand weeding. □

### Effect of herbicide mixtures in transplanted rice

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We evaluated the efficiency of some new herbicide mixtures in transplanted rice

**Effect of weed control treatments on weed population, weed dry matter, and grain yield of rice.<sup>a</sup> Coimbatore, India.**

| Treatment <sup>b</sup> | Timing <sup>c</sup> | Rate<br>(kg ai/ha) | Weed population (no./m <sup>2</sup> ) at 40 DT |        |        |         | Total weed<br>dry matter<br>(g/m <sup>2</sup> ) | Grain<br>yield<br>(t/ha) | Cost of<br>weed control<br>(\$) |
|------------------------|---------------------|--------------------|--|--------|--------|---------|---|--------------------------|---------------------------------|
|                        |                     |                    | Grass  | Sedge  | Dicot  | Total   |   |                          |                                 |
| EPTC + 2,4-D           | PE                  | 1.12+0.56          | 9.0 b  | 10.7 d | 10.3 c | 30.0 c  | 14.1 c  | 5.8 a                    | 19.25                           |
| Molinate + 2,4-D       | PE                  | 1.80+0.56          | 3.7 a  | 2.0 a  | 3.8 a  | 9.5 a   | 10.1 ab   | 6.2 a                    | 35.85                           |
| EPTC - propanil        | EPE                 | 1.44-1.44          | 20.2 c   | 13.5 e | 11.3 c | 45.0 d  | 19.9 d  | 5.5 a                    | 27.64                           |
| Molinate - propanil    | EPE                 | 1.44-1.44          | 8.7 b  | 7.8 c  | 11.5 c | 28.0 c  | 12.2 bc   | 5.9 a                    | 40.00                           |
| Butachlor              | PE                  | 1.50               | 6.2 ab   | 7.5 c  | 6.3 b  | 20.0 b  | 13.8 c  | 5.8 a                    | 20.73                           |
| Hand weeding twice     |                     | -                  | 4.0 a  | 5.2 b  | 4.0 a  | 13.2 a  | 9.3 a   | 6.2 a                    | 40.65                           |
| Unweeded check         |                     | -                  | 104.5 d  | 31.5 f | 38.0 d | 174.0 e | 73.5 e  | 3.1 b                    | -                               |

<sup>a</sup>Means of four replications. In a column, means followed by the same letter are not significantly different from each other by DMRT. <sup>b</sup>+ = tank mixture, - = proprietary mixture. <sup>c</sup>PE = preemergence, EPE = early postemergence.

in a field experiment at the university farm summer 1986. Treatments were EPTC + 2,4-D (ethyl ester), molinate + 2,4-D, and EPTC - propanil and molinate - propanil compared with butachlor, hand weeding twice (HWT), and an unweeded check. The herbicides were applied as preemergence (3 d after transplanting [DT]) or as early postemergence (12 DT).

Major weed flora in the experimental field were *Echinochloa crus-galli*, *Echinochloa colona*, *Cyperus difformis*, *Eclipta prostrata*, *Ammannia baccifera*, and *Monochoria vaginalis*. Preemergence application of molinate + 2,4-D effectively controlled all three groups of weeds (see table).

At 40 DT, grass weed control by

molinate + 2,4-D was comparable with that by butachlor; control of sedge and broadleaf weeds was superior to all other herbicides. Molinate - propanil and EPTC + 2,4-D also were promising. HWT was comparable with molinate + 2,4-D. Costs of weed control were highest for hand weeding twice and molinate - propanil. □

**Effect of time and method of application of herbicides on yield and yield components of rainfed lowland rice**

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We studied the effect of time and method of herbicide application on yield and yield components of rainfed lowland rice during wet season 1987. Four herbicides were applied with sand or water at different rates and times. Butachlor, thiobencarb, and pendimethalin were applied at 1.5 kg ai/ha, 2,4-D at 0.9 kg ai/ha, in 1,000 liter water/ha or in 60 kg sand/ha.

BPT2740 was drill seeded on unpuddled soil 17 Aug 1987. Fertilizer was 100 kg N as urea, 17 kg P as single superphosphate, and 50 kg K as muriate of potash/ha. The crop was grown under rainfed condition to 40 d after seeding (DAS), then irrigated. Weed dry weight was measured 60 DAS.

Butachlor applied 1 DAS was equivalent to hand weeding (see table). Pendimethalin at 1 DAS or 2,4-D at 7

**Effect of time and method of application of herbicides on weed growth and yield of rainfed lowland rice.**

| Treatment <sup>a</sup>         | Weed dry weight<br>log transformed<br>values <sup>b</sup> | Panicles/m <sup>2</sup><br>(no.) | Filled<br>grains/panicle<br>(no.) | Grain<br>yield<br>(t/ha) |
|--------------------------------|---|----------------------------------|-----------------------------------|--------------------------|
| Butachlor<br>1 DAS             | 12.6 (160)  | 273                              | 111                               | 3.3                      |
| Butachlor<br>7 DAS             | 38.2 (1460)   | 200                              | 86                                | 2.5                      |
| Butachlor<br>7 DAS with sand   | 43.9 (1930)   | 205                              | 51                                | 1.7                      |
| Thiobencarb<br>1 DAS           | 31.4 (990)  | 189                              | 62                                | 1.9                      |
| Thiobencarb<br>7 DAS           | 29.8 (890)  | 241                              | 101                               | 2.8                      |
| Thiobencarb<br>7 DAS with sand | 30.6 (933)  | 235                              | 100                               | 2.7                      |
| 2,4-D EE<br>1 DAS              | 40.8 (1660)   | 187                              | 102                               | 2.6                      |
| 2,4-D EE<br>7 DAS              | 22.7 (513)  | 262                              | 105                               | 3.1                      |
| Pendimethalin<br>1 DAS         | 19.2 (367)  | 265                              | 106                               | 3.2                      |
| Hand weeding<br>20 and 40 DAS  | 2.4 (5)   | 277                              | 112                               | 3.5                      |
| Unweeded control               | 52.2 (2833)   | 5                                | 23                                | 0.1                      |
| LSD (0.05)                     | (16.5)  | 72                               | 13                                | 2.9                      |

<sup>a</sup>DAS = days after sowing. <sup>b</sup>Values in parentheses are weed wt in kg/ha.

DAS was similar to butachlor applied 1 DAS. □