Cryptoblabes gnidiella, an azolla pest on rice in India

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Use of azolla, an N-fixing fern, is increasing in India. Effective insect control is essential to successful azolla cultivation. *Cryptoblabes gnidiella* Lep. Pyralidae is a major pest of azolla and sorghum in India, but has not been reported to attack rice.

During azolla multiplication in transplanted rice fields at CRRI in 1983 rabi and kharif, *C. gnidiella* larvae moved from the azolla mat onto rice tillers, joined 3-4 leaves or folded a single leaf, formed a pupal case, and pupated (see figure). The larvae did not feed on the rice leaves. Three to seven larvae pupated in each rice hill depending on the level of azolla infestation. Infested plants looked similar to leaffolder-infested plants. The pupal period lasted 7 to 12 d. □



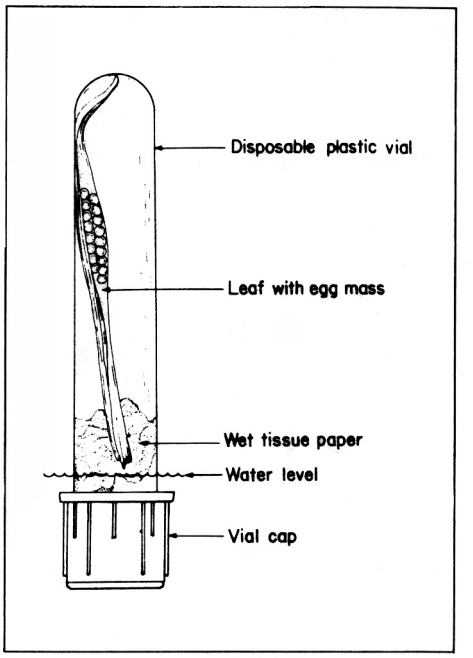
Rice leaves folded by mature *C. gnidiella* larvae, Orissa, India, 1983.

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A method for holding eggs of rice insect pests for parasite emergence

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The most common technique for holding insect eggs for parasite emergence is placing the cut plant part in a petri dish lined with moistened cotton or filter paper, or inside a test tube with a small amount of water at the bottom and plugged with cotton on top. Two problems occur: 1) rice leaves dry in a week, and 2) parasites become tangled in the cotton wadding. We developed an improved method (see figure) that keeps leaves green for 15 d, which is sufficient for parasite emergence. The freshly cut leaf with eggs is put inside a vial which is plugged with wet tissue paper. The vials are kept open end down in a jar or basin with 5 mm water for continual wetting. □



Setup for prolonged rearing of insect eggs on a cut rice leaf.

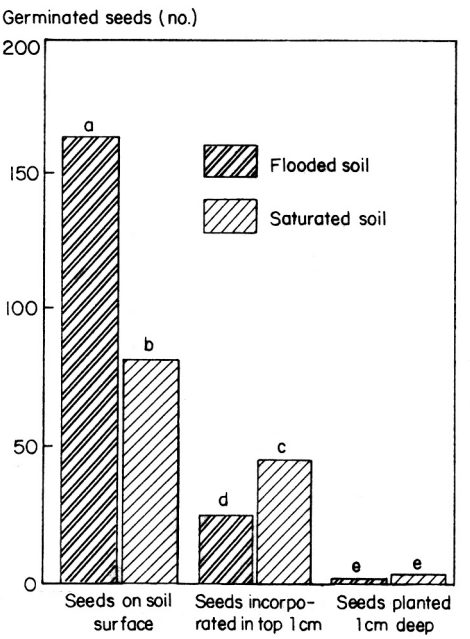
Effect of soil moisture and burial on germination of *Cyperus difformis* seeds

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Cyperus diffomis L. is one of the commonly occurring annual sedge weeds in transplanted rice in South and Southeast Asia because it is a prolific seed producer. We studied the effect of seeding depth, moisture regime, and light on *C. difformis* germination.

Soil was placed in 10.2-cm-high, 7.6-cm-diam plastic cups. Ten mg of seeds were broadcast on the soil surface, mixed with the top 1 cm of soil, or planted 1 cm below the surface. The soil was saturated or flooded with 1 cm of water. The treatments were replicated three times in a randomized complete block design. Germinated seeds were counted 15 d after seeding. We studied the effect of different light intensities on germination in a separate experiment and found that light is needed for germination.

Under flooded and saturated conditions, seed germination was highest when seeds were broadcast on the soil surface and least when the seeds were placed 1 cm below the soil, indicating that light is needed for germination (see figure). This observation was confirmed in the other study where no seeds germinated when soaked seeds were kept in the dark.



Germination of *Cyperus difformis* seeds as affected by seeding method and moisture regime. Means with a common letter are not significantly different at the 5% level.

When the seeds were broadcast on the soil surface, germination was significantly higher in flooded soil than in saturated soil, indicating that high moisture favors germination. For seeds mixed in the top 1 cm of soil, germination was significantly higher in saturated than in flooded soil, indicating the need for oxygen in addition to light for germination. Flooding restricts oxygen diffusion into the soil profile. Therefore, the oxygen content of soil close to the surface was probably higher under saturated than under flooded conditions.

Few seedlings emerged when the seeds were placed 1 cm deep. Lack of light, low oxygen concentration, increasing carbon dioxide concentration, and toxic gaseous products of anaerobic decomposition were probably involved. Thus, germination of *C. difformis* can be substantially reduced by flooding and deep plowing. □

Pest Control and Management

WEEDS

Effect of preemergence herbicides on *Echinochloa crus-galli* (L.) Beauv. and *Cyperus difformis* L. in transplanted rice

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In 1982 monsoon season we studied the efficacy of individual and combinations of herbicides molinate + 2,4-D, oxyfluorfen, oxadiazon, thiobencarb, butachlor, pendimethalin, and 2,4-D sodium salt.

Weeds in the experiment field were grasses *Echinochloa crus-galli* (L.) Beauv., *E. colonum* (L.) Link, *Paspalum* sp.; sedges *Cyperus difformis* L., *C. iria, Fimbristylis miliacea* L., and *Scirpus* sp.; and broadleaves and aquatics *Eclipta* alba (L.) Hassk, *Ammannia baccifera* L., *Marsilea quadrifolia* L., *Monochoria vaginalis* L., *Rotala densiflora,* and *Ludwigia parviflora. E. crus-galli* and *C. difformis* predominated and were effectively controlled by the herbicide treatments.

Effect of preemergence herbicides on weeds and transplanted rice, Coimbatore, India.[a]

Treatment	Herbicide dose (kg ai-ae/ha)	Weeds/m^2 at 30 DT			Total weed dry matter (g/m^2) at 30 DT	Productive tillers (no./m^2)	Grain yield (t/ha)
		E. crus-galli	*C. difformis*	Total grass, sedge, and broadleaves			
Molinate + 2,4-D	1.5 0.5	4	–	25	3	396	4.7
Molinate + 2,4-D	2.0 0.5	7	9	29	6	420	5.0
Molinate + 2,4-D	2.5 0.5	5	12	49	7	400	4.4
Oxyfluorfen	0.15	27	12	49	16	380	4.4
Oxadiazon	0.75	–	4	19	8	444	5.4
Thiobencarb	1.5	5	15	44	9	416	5.1
Butachlor	1.5	12	17	77	8	420	4.8
Pendimethalin	1.25	7	13	25	5	464	5.5
2,4-D sodium salt	0.8	9	19	43	7	424	4.0
Hand weeding at 15 and 35 DT		21	4	112	6	420	5.0
Unweeded control		57	52	128	14	336	3.5
CD		3	3	29	2	44	0

[a] DT = days after transplanting.

Molinate + 2,4-D gave a broad spectrum of weed control. Molinate + 2,4-D, oxadiazon, and pendimethalin reduced weed dry matter production and increased productive rice tillers. Preemergence application of pendimethalin at 1.25 kg/ha followed by one hand weeding gave the highest grain yield (5.5 t/ha), followed by oxadiazon 0.75 kg/ha (see table). □

Major lowland rice weeds of Koraput District, Orissa

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Rice is the major kharif crop in the lowlands of Koraput District. Weed population in blocks throughout the district was randomly sampled in 1982 and 1983 and the following weed groups were identified as the most common and problematic in rainy season. There were 31 problem weeds — 12 sedges, 10 grasses, 8 broad-leafed weeds, and 1 fern.

Sedges. *Cyperus rotundus, C. iria, C. imbricatus, C. amabilis, C. exaltatus, C. diffomis, C. compactus, C. articulatus, Fimbristylis dichotoma, F. miliacea, Rhynchospora corymbosa, Scirpus articulatus.*

Grasses. *Echinochloa colona, E. crus-galli, Brachiara distachya, Leptochloa chinensis, Digitaria sanguinalis, Eleusine indica, Dactyloctenium aegyptium, Panicum texanum, Eragrotis atrovirens, Oryza sativa* (wild rice).

Broad-leafed weeds. *Commelina diffusa, Ludwigia perennis, Sesbania exaltata, Aeschynomene indica, Heteranthera reniformis, Oxalis corniculata, Hydrolea zeylanica, Portulaca oleracea.*

Fern. *Marsilea quadrifolia.* □