

Parasitic Fungi on Wild Rice in India

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Oryza rufipogon Griff., a species of wild rice, commonly occurs as a weed in the rice fields and near the banks of rainfed ponds in the eastern districts of Uttar Pradesh. It is closely related to the cultivated rice species *Oryza sativa* Linn. and simulates the cultivated rice in vegetative characters. The weed is difficult to eradicate from the invaded fields and is, therefore, regarded a noxious weed. The plant is extremely vigorous and aggressive in its mode of growth and is a very successful competitor with the more valuable cultivated rice (1). The grains dehisce at maturity and owing to this special feature, cultivators suffer a heavy loss in rice yield in severely infested fields. The loss in yield remains directly proportional to density of the wild rice plants in the field, which may range from 2 to even 30—40%. It persists from year to year through the self-sown seed in infested fields. Only buffaloes can consume it as fodder to some extent. General distribution of the plant in this region indicates that the plant thrives only in the low-lying fields and stagnating ponds accumulating rain water through a major part of the rainy season. In well drained fields, it is not a serious problem at all.

Several interesting parasitic fungi were collected on this host during the last 3 years. The symptoms of infection and morphology of these fungi indicated several of them identical to those parasitizing the cultivated rice. It is possible that this weed may be playing a collateral host for these pathogens augmenting the primary inoculum potential and helping their spread on the cultivated rice. An account of the infection symptoms and morphological characters of the pathogens is presented here.

1. *Cercospora oryzae* Miyake var. *rufipogonis* var. nov.

Maculae lineares vel fusiformes, nervis limitatae, numerosae, primum brunneae, postea in centro cinerascetes et confluentes, $5-15 \times 0.5$ mm; caespituli amphigeni; conidiophora e stomatiis erumpentia, 2—7-fasciculata, pallide brunnea, apicem versus expallescentia, geniculata, ad basim crassiora, 0—12-septata, raro ramulosa, $28-154 \times 3-5.6 \mu$; conidia subhyalina, cylindracea vel angustissime obclavata, recta vel curvula, postice truncata, antice rotundata, 1—12-septata, raro ad 1—2 septa constricta, $19.6-85 \times 4-5.8 \mu$.

Leaf spots linear to fusoid, interveinal, numerous, brown later changing to ashen-grey in the centre, coalescent, $5-15 \times 0.5$ mm; fruiting amphigenous. Conidiophores emerging through stomata in groups of 2 to 7, light brown, paling towards the tip, geniculate, base wider, spore scars prominent, 0—12 septate, rarely branched, measuring $28-154 \times 3-5.6$ μ . Conidia subhyaline, cylindric to obclavate, straight to curved, truncate at the base, tip rounded obtuse, 1—12 septate, rarely constricted at 1 or 2 septa and measuring $19.6-85 \times 4-5.8$ μ .

On living leaves and leaf sheaths of *Oryza rufipogon* Griff. at Varanasi, U. P. on 1 November, 1964. Leg. R. A. Singh. TYPE (MSP no. 348). Portion of the type material is being deposited in the Herbarium Crypt. Indiae Orient., Indian Agricultural Research Institute, New Delhi.

Severe infection has been observed on plants growing along the borders of ponds. The brown, linear lesions are encountered late in September on leaves and leaf sheaths, later coalescing into patches. The symptoms are nearly similar to those on the cultivated rice incited by *Cercospora oryzae* Miyake except the relatively irregular, coalescent nature of the lesions in the present case. Besides this variation in symptoms, conidiophores in the present fungus emerge in groups of 2 to 7 in contrast to 2 to 3 in *C. oryzae* and the conidia are bigger in size. In view of these minor but distinct differences the fungus is described as a new variety of *C. oryzae*.

2. *Entyloma oryzae* H. & P. Sydow in Ann. Mycol. 12: 197, 1914; Saccardo in Sylloge Fungorum 23: 625, 1925.

In living leaves and leaf sheaths of *Oryza rufipogon* Griff. at Varanasi, U. P. on 10 September, 1963. Leg. R. A. Singh.

The sori become discernible by end of August on the plants abundantly growing along the border of the ponds. The sori are small to elongate, rectangular, well isolated, dull black and non-erumpent. Development of the symptoms on this host and morphology of the fungus are identical to those on the cultivated rice. This fungus has been recorded on wild rice species (?) from Australia (14), while this report records its parasitism on another wild rice species.

3. *Helminthosporium oryzae* Breda de Haan in Bull. Inst. Bot. Buitenz. 6: 11, 1900; Saccardo in Sylloge Fungorum 22: 1394, 1913 and 25: 822, 1931.

On living leaves and leaf sheaths of *Oryza rufipogon* Griff. at Varanasi, U. P. on 30 October, 1965. Leg. R. A. Singh.

Moderate to severe spotting on the leaves and leaf sheaths is observed on the plants. The symptoms appear late in September and infection becomes severe in October—November. Lesions are amphigenous, elliptical to cylindrical, tan brown turning greyish in the centre. Frequently, both cultivated and wild rice plants show the infection simultaneously in the same field. The incitant fungus appears identical

to *Helminthosporium oryzae* in the infection symptoms as well as morphological characters, to which it is referred.

The fungus has quite a wide host range and several graminaceous plants have been reported as collateral hosts from various places. Natural infection by the fungus has been observed on *Oryza montana* Lour. (5, 9), *Leersia hexandra* Sw. (2), *Panicum colonum* Linn. (= *Echinochloa colona* Link) (3) and on wild rice (14). Artificial inoculations with the fungus culture have induced disease symptoms on *Cynodon dactylon* Pers., *Digitaria sanguinalis* Scop. and *Eleusine indica* Gaertn. (5). The present wild rice species adds yet another collateral host for the pathogen.

4. *Leptosphaeria salvinii* Cattaneo in Arch. Bot. Crittog. Pavia 2—3: 126, 1877; Saccardo in Sylloge Fungorum 2: 62, 1883.
 = *Helminthosporium sigmoideum* Cavara in Rev. Mycol., 185, 1889;
 Saccardo in Sylloge Fungorum 10: 615, 1892.
 = *Sclerotium oryzae* Cattaneo in R. C. Ist Lombardo, Ser. 2: 801—807, 1876; Saccardo in Sylloge Fungorum 14: 1153, 1899.
 In leaf sheath and stem of *Oryza rufipogon* Griff. at Varanasi, U. P. on 3 October, 1964. Leg. R. A. Singh.

Stem rot infection has been observed on wild rice in cultivated rice fields as well as in shallow ponds adjacent to these fields. Initial infection starts in the middle of August with the appearance of dark brown discoloration of the leaf sheath at the water line and further disease development is identical to that in the cultivated rice. Minute, black, glistening sclerotia in the stem and brownish black perithecia on the leaf sheath develop simultaneously in the infected culms (10). Weakened plants break and lodge in the field late in the season. Comparative morphology of the fungus indicates its resemblance to *Leptosphaeria salvinii*, to which it is referred.

The conidial stage of the fungus has been reported to occur on *Zizaniopsis miliacea* (Michx.) Doell. & Aschers and the sclerotial stage on *Panicum colonum* Linn. (= *Echinochloa colona* Link) (13). Occurrence of the fungus on this host indicates it as a potential collateral host helping in multiplication and increase of the inoculum potential for the succeeding crop.

5. *Neovossia horrida* (Takahashi) Padwick and Azmatullah Khan in Mycol. Pap., Imp. Mycol. Inst. 10: 2—4, 1944.

In kernels of *Oryza rufipogon* Griff. at Varanasi, U. P. on 12 September, 1965. Leg. R. A. Singh.

Infection by this bunt is relatively rare and only few infected grains were collected from a fairly wide area. Comparative morphology of the fungus indicates its resemblance with *Neovossia horrida*, to which it is referred.

6. *Phyllosticta miurae* Miyake in J. Coll. Agric. Tokyo 2: 253, 1910; Saccardo in Sylloge Fungorum 22: 864, 1913.

On living leaves of *Oryza rufipogon* Griff. at Varanasi, U. P. on 13 September, 1964. Leg. R. A. Singh.

Initial symptoms of infection are noticed during August as oval to fusoid, $5-45 \times 2-9$ mm, water-soaked, scattered leaf spots, later becoming bleached to ashen-grey and surrounded by a narrow brown band. Necrotic tissues in the lesions may show shredding. Amphigenous, minute, black pycnidia become evident in the centre of the lesion. Rarely the lesions elongate irregularly involving large laminar areas. The infection occurs predominantly on plants along the banks of the ponds. The symptoms produced by this organism on cultivated rice are a little different, in which leaf-drying starts from the tip or edges advancing inward and downward to the leaf base up to $\frac{1}{3}$ leaf length. The disease on wild rice has been noticed in small, scattered areas involving 40% plants with few leaves infected in the plant. Comparative morphology of the fungus indicates that the present fungus is identical to *Phyllosticta miurae*, to which it is referred.

7. *Piricularia oryzae* Cavara in Fungi Longob. exsicc. no. 49, 1891; Saccardo in Sylloge Fungorum 10: 563, 1892.

On living leaves, leaf sheaths, nodes and rachis of *Oryza rufipogon* Griff. at Varanasi, U. P. on 10 August, 1964. Leg. R. A. Singh.

Infection starts as small, bluish tinged, oval to fusiform, water-soaked spots, later enlarging irregularly and changing to greyish-green due to production of conidiophores and conidia. Intensity of spotting increases with frequent rains and high atmospheric humidity, but remains low during a relatively dry weather spell. Neck infection occurs below the panicle, girdling the stem with a dark brownish blotch. In early neck infections, grain formation is totally inhibited, but they are partially formed in late infections. The disease syndrome is similar to that on the cultivated rice. Morphologically the fungus is identical to *Piricularia oryzae*, to which it is referred.

The pathogen has a wide host range and its occurrence reported on several collateral hosts such as *Panicum repens* Linn. and *Digitaria sanguinalis* Scop. (= *Digitaria marginata* Link) (8, 12); *Setaria verticillata* Beauv. (= *Setaria intermedia* Roem. & Schult.) (7), *Dinebra arabica* Facq. (= *Dinebra retroflexa* Panz.) and *Panicum repens* Linn. (3) and wild rice (4). Thomas (11) demonstrated that *P. oryzae* could also infect wheat, barley, oats, corn and *Setaria italica* Beauv. The present report adds another collateral host for the fungus in the country. 8. *Pyrenochaeta oryzae* Shirai ex Miyake in J. Coll. Agric.

Tokyo 2: 255, 1910; Saccardo in Sylloge Fungorum 22: 934, 1913.

On living leaf sheath and ligule of *Oryza rufipogon* Griff. at Varanasi, U. P. on 5 October, 1965. Leg. R. A. Singh.

Ashen-grey, elongated to irregular patches appear on the ligule and leaf sheath during the grain filling stage in October. The plants growing in the ponds as well as in the rice fields are infected alike.

The lesions become studded with minute, half-erumpent, black pycnidia. Development of the syndrome is otherwise similar to that on the cultivated rice (6). The fungus closely resembles *P. oryzae* in its morphology to which it is referred.

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