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Integrated Disease Management in Direct Seeded Rice

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ARTICLE ID: 27

Introduction

India is the second largest producer, consumer and exporter of rice after china. Rice is the most dominant cereal crop accounting 45% of total food grain production of the country. India produces 112.91 million tonnes of rice from an area of 43.79 million ha during 2017-18. However the country ranked 9th in term of productivity (2578kg/ha) in the world which is far below the world average below of 3173kg/ha. It occupies a pivotal place in Indian agriculture and provides 43% calorie requirement for more than 70% of its people. It accounts for about 42% of total food grain production and 55% of cereal production in the country. It is cultivated in three season *i.eAus* (April to June), *Aman* (June to November) and *Boro* (November to April).

In Bihar state rice is grown in 3.30 million ha. Covering 60% of net cropped area. Producing 8.09 million tonnes with the productivity of 2447 kg/ha (DFS, 2017-18) The productivity of crop in the state far below the nation average (2578 kg/ha) in the state rice is grown in versatile adaptation from precarious moisture as rainfed upland to deep water area having 3-4 meter water asa deep water crop with many intermediate situation in between. The diverse ecological situation. Varying climate and pedagogical diversities make rice cultivation a highly risky venture resulting in overall poor productivity of the crop in the state. In bihar around 33% of total rice area in the state is under assured irrigation while remaining 67% in under rainfed situation.

In last few years Bihar state is suffering from several drought in rice growing district of bihar. Due to drought and severity of field Lawrence in states, farmers of bihar preferring direct seeding of rice.

Major diseases of Direct Seed Rice in Bihar:

BLB, Sheath Blight,Brown spot,Sheath rot, False Smut.

Bacterial leaf blight of Rice

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Bacterial leaf blight is a major production constraint especially in irrigated and rainfed lowland ecosystems in India. In recent years, this disease has been reported to, appear regularly al an alarming intensity in many rice growing areas. Major BLB epidemic occurred in northern India during 1979 and 1980, Plalakkad district of kerala during 1998 and recently, on BPT 5204 variety in Kurnool district of AP. Yield loss may be as high as 50%. In Bihar BLB mainly affects Seed Production Programme and hybrid rice varieties.

Symptoms

Two phases viz.,

- leaf blight phase
- kresek phase

Leaf blight phase Starts as water soaked lesion on the tip of the leaves, increases in length downwards and turns into yellow to straw coloured stripes with wavy margins. Lesions may be developed at one or both edges of the leaves or along the mid rib. In humid areas, on the Surface of the young lesions, yellowish, opaque and turbid drops of bacterial ooze may be observed in the early morning(inset).

Kresek (wilt) phase: The leaves roll, droop, turn yellow or grey and ultimately the tilers wither away. This phase is more destructive. In severe cases, the affected hills may be completely killed. The "kresek infected tillers may be confused with stem borer injury but the latter can be easily pulled out while it is not so with the 'kresek" affected tillers.

Field diagnostic test Ooze test: There is a simple test to diagnose bacterial leaf blight in comparison to other pathological and physiological leaf drying symptoms in the field. When the infected leaves are cut into small bits and put into water in a glass tube or beaker. The water becomes turbid and yellowish after some time (15-20 minutes). This is due to the release of the bacterial masses into the water from the cut ends.

The pathogen: The causal bacterium *Xanthomonasoryzae*pv. *Oryzae* is a gram negative, non-spore forming rod shaped bacterium which is motile by single polar flagellum. Colonies on culture media are round and yellow in colour due to production of a pigment called Nanthomonadin'.

Disease Cyele Self-sown plants in low lands, infected straw and stubble, wild rice and weeds during the off season serve as a source of primary inoculum. Infected straw, when applied in nursery soil or near and irrigation canal, serves as the primary source of inoculum.

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Infected straw piled on the bunds serve as one of the major sources of primary inoculum. High humidity, moderate temperature, prolonged rainfall or drizzling condition, cycione. Flood and windy or stormy condition favours the development and spread of the disease. Excess application of nitrogen and late top dressing increases the disease incidence.

Management of the disease

- Grow resistant variety like RajendraBhagwati. Swana, Ajaya. IR64, Saket-4, Rajshree. AndPrabhat etc.
- Moderate level of 60-80 kg N/ha with required potassium may be recommended in endemic areas during the wet season. The nitrogen should be applied in 3-4 splits. Adoption of cultural practices like clean field and bunds. Avoidance of field to field irrigation and use of healthy seeds will reduce the intensity of the disease.
- Seed treatment with *Pseudomonas fluorescence* @ 10g per kg of seed.

Sheath blight

Causal organism: *Rhizoctoniasolani*

Symptoms:

Initial symptoms are noticed on leaf sheath near water level. As the spots enlarge, the centre becomes grayish white with an irregular blackish brown or purple brown border. Lesions on the upper parts of plants extend rapidly to cover entire tillers up to the flag leaf. The presence of several large lesions on a leaf sheath causes death of the whole leaf and in severe cases all the leaves of a plant blighted. The infection spreads of the inner sheath and resulting in death of the entire plant. Older plants are highly susceptible. Five to six week old leaf sheaths are highly susceptible. Plants heavily infected in the early heading and grain filling growth stages produce poorly filled grain. The fungus affects the crop from tillering to heading stage.

Pathogen

The fungus produces usually long cells of septate mycelium which are hyaline when young. Yellowish brown when old. It produces large number of globosesclerotia, which are initially white. later turn to brown or purplish brown.

Favourable Conditions

High relative humidity (95 percent). High temperature (30-32^{0}C), closer planting and heavy doses of nitrogenous fertilizers.

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Disease cycle:

Sclerotia serve as one of the major sources of primary infection. In the infected straw tropics, piled up on the bunds, stubbles and infected weeds also contribute significantly to the primary infection (plants nearby bunds get infected).

Management

- None of the commercially popular varieties have desired level of disease, however, varieties resistance to this like Swarnadhan, Radha, Pankaj and been reported to have field Vikramarya have tolerance.
- Adopt cultural practices like wider spacing (to reduce high humidity in the plant ecosystem and to reduce plant to plant contact), destruction of stubbles, weeds in and around rice fields, adoption of green manuring and avoidance of field to field irrigation.
- If still disease appears in the main fields, then apply Validamycin 31@2.5 ml/PdrPropiconazole 25 EC @ m/l or hexaconazole 5 EC@ 2ml/l or carbedazim 50 WPalg l or thitluzamide 24 SC@ 30g a.i. ha. Many-times, the disease appears in patch near the bunds and progresses inside the main fields. In such cases, spraying can be restricted to those patches so that further movement of the disease inside the field will be checked. This will reduce the amount of fungicide application.
- Many combination products like Filia 52.5 SE (tricyclazole and Propiconazole combination). Nativo 75 WG (trifloxystrobin and tebucanazolecomtinatioin) @ 0.4 gl. Iusture 37.5 SE (Flusilazole in combination with Carbendazim) have also been found very etfective against the disease.

Brown Spot

Causal organism:*Helminthosporiumoryzae*

Symptoms:

The disease appears from seedling to maturity stage. The disease appears first as minute brown dots on the coleoptiles, leaf blade, leaf sheath and glumes, being most prominent on the leaf blade and glumes. The spots have a light brown to gray center, surrounded by a reddish brown margin. The several spots coaleasce and the leaf dries up. The seedling die and affected nurseries can be often recognized from a distance by their brownish scorched appearance. Dark brown or black spot also appear on glumes. This is also called

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Sesame leaf spot as the spot on the leaves look like sesame Seeds. It is also called poorman's disease because it appears mostly in deficit spots.

Favourable Conditions

Temperture of 25-30^{0}C with relative humidity above 80 percent are highly favourable.

Managenment

- Grow resistant varieties like RajendraBhawati, Dhanlaxmi, Prabhat, Rajshree etc.
- Seed treatment with Carbendazim 50 WP a 2y/kg seeds Bio-o (a Renuval of collateral hosts and infected debris on the bunds and in the main field Application of nitrogen in three split doses and correction of soil deticiency with potash, managanese and Zinc.
- Spray Mancozeb @ 2.5g/Lit or Hexacanazole @ 2 ml/Lit just after appearance of initial symptom.

Sheath rot

Causal Organism: *SarocldiumOryzae*

Symptom

The Pathogen attacks heading top maturity stages and the upper most leaf sheath enclosing the young panicles. Oblong or irregular brown spot appear on the boot leaf sheath. The young panicle may remain with the sheath or emerge partially, the panicle rot and abundant whitih powdery fungal growth is formed inside and outside the leaf sheath. If the pathogen attackes after the panicle emergence, the grain may be partially filled and lead to glum discoloration.

Pathogen

The fungus produces whitish, sparsely branches and septed mycelium. Conidia are hyaline smooth, single celled and cylindrical in shape.

Favourable Condition

Closer planting, application of high doses of nitrogen, high humidity and tempreture around 25-30^{o}C.

Management

- Growing of moderately resistant varitiesBala, Kakatiya, Janaki, Tella, and Sabarmati.
- Seed treatment with Mancozeb 75WP @ 2.5G/KG OF SEED
- Adopt optimum spacing 20x15 cm. row to row and 15x15cm plant to plant.

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- Avoid excess nitrogen, skip final nitrogen in sheath rot infected field.
- Distraction of infected plant debris by burning.
- Soil application of gypsum in 2 equal splits (500kg/ha) reduce the sheath rot incidence.
- Propiconazole @ 1 ml/lt or Edifenphas @ 2 ml/lt of water.

False smut

Symptoms

Symptoms are visible after flowering only, where the fungus infects the young ovary of the individual kernels and transforms them into large, velvety green balls (smut ball). Initially the smut balls are small and remain confined between glumes. They gradually enlarge. And enclose the floral parts. The smut ball are initially yellow in colour and are covered by membrane, later the membrane bursts and the colour changes to orange, yellowish green, green, olive green and finally greenish black. Usually only a few grains are affected in a panicle and may increase up to 100 in case of severe disease incidence. Chlamydospores are formed later on the sporeballs.

Pathogen

U. virens produces both sexual (ascospores) and asexual (chlamydospores) stages in its life cycle.

Management

- Use of sclerotia and help to Chlamydospore contamination free seeds and early planting can escape the heavy disease incidenee. Spraying of 0.1% Propiconazole @1gm/lt during flowering can control false smut of rice/Spraying of chlorothalonil 75 WP @ 2 ml/l or carbendazim @ 2 g/lit of water, can also reduce the disease incidence.