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Participatory appraisal for biointensive IPM research in Basmati rice: A case study

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ABSTRACT

On-farm research trial on biointensive pest management in basmati rice (Pusa Basmati-1) was conducted during wet season 2006 in farmers participatory mode in Haridwar district of Uttarakhand with three treatments comprising of farmers' practice (FP), chemical based pest management (CBP) and Integrated pest management (IPM) in four villages having two locations in each village. In case of IPM, the crop suffered less incidence of insect pests viz. stem borer (2.43%), leaf folder (4.2%), grasshopper (2.24%); diseases viz. brown spot (2.47%), sheath blast (7.46%), BLB (2.18%) and false smut (0.74%), in contrast to farmers' pest management practices in which crop suffered with stem borer (5.14%), leaf folder (7.68%), grass hopper (4.53%); brown spot (7.32%), sheath blast (10.24%), BLB (5.63%) and false smut (6.21%). The yield data of various treatments indicates that the IPM plots recorded highest yield i.e., 4.6 t ha^{-1} in comparison to FP (3.1 t ha^{-1}) and CBP (4.4t ha^{-1}). The highest cost benefit ratio was recorded in IPM (13.16) followed by CBP (12.92) and FP (2.84). The study revealed the cost effectiveness of integrating non-pesticidal strategies with additional benefits like safety to beneficial organism and reduction in pesticide load to the enviornment.

Key words: *Basmati rice, insect pests, diseases, biointensive IPM*

In Uttarakhand, basmati rice is grown in about 17% of the total rice area, a major export item among the agriculture products. Among the major constraints in achieving the potential yield of Basmati rice cultivars in the state, the damage by insect pests *viz*., yellow stem borer, leaf folder, White backed plant hopper (WBPH), gundhi bug; diseases *viz*., Bacterial leaf blight (BLB), blast, brown spot are important (Gaurav and Kang, 2004; Singh *et al*., 2005, Sachan *et al*., 2006). Basmati being a cash crop in the state, the farmers do not hesitate to apply high inputs including pesticides for managing the pests. The excessive use of pesticides has resulted in reduction of biodiversity of natural enemies, development of pesticide induced resistance and outbreak of secondary pests. Though diverse pest management strategies have helped to reduce losses in Basmati rice, but not yet provided a lasting solution due to non-availability of well-knitted, holistic IPM modules for the location specific problems and lack of awareness among farmers. Therefore, it has become imperative to develop a location specific biointensive IPM module for tackling insect pests and diseases of rice. On-farm research trial on biointensive pest management in basmati rice (Pusa Basmati-1) was conducted during wet season 2006 in farmers participatory mode in Haridwar district of Uttarakhand with three treatments comprising of farmers' pest management practice (FP), chemical based conventional pest management (CBP) and Integrated pest management (IPM) in four villages having two locations in each village. The treatment details are as follows : Farmers' practice (FP):1 application of carbofuran @ 25kg ha^{-1}, 1-2 application of carbendazim and streptocycline, 1-2 application of chlorpyriphos/monocrotophos/ endosulfan. Conventional chemical based protection (CBP): Seed treatment with carbendizm @ 2gm kg^{-1} of seed, Application of carbofuran@1.0 kg a.i.ha^{-1} at 15DAT, Spray application of chlorpyriphos 20EC @500ga.i.ha^{-1} at 40 and 60DAT, Spray application of valdimycin 500ml ha^{-1} at 40DAT. IPM module: Summer ploughing and clean cultivation, Seed treatment with *Tricoderma* sp. + *Pseudomonas* sp. @ 4g kg^{-1} seed, Installation of monitoring pheromone traps (YSB) after 20 days of transplanting @ 3traps ha^{-1}, One release of *Trichogramma japonicum* egg

parasitoids @100,000 ha^{-1} depending on the incidence of yellow stem borer moths. Spot application of chlorpyriphos 20EC @ 0.2% in termite infested patches, Spray of carbendizm (0.2%) for sheath blight and streptocycline (0.06%) for BLB infected patches, Need based application of insecticides/fungicides.

The observations on percent stem borer damaged ear head (WEH), leaf folder damaged leaves (LFDL), grass hopper damaged leaves (GHDL) and disease incidence were recorded from 50 randomly selected hills plot^{-1} at fortnightly intervals and the mean data were calculated. The yield data were recorded from 5x5 m area per plot and computed per hectare yield and the data were statistically analyzed. Finally, net gain per rupee invested was calculated based on the yield data and pest management practices followed in different treatment regimes.

In case of IPM, the crop suffered less incidence of insect pests *viz*. stem borer (2.43%), leaf folder (4.2%), grasshopper (2.24%); diseases *viz*. brown spot (2.47%), sheath blast (7.46%), BLB (2.18%) and false smut (0.74%), compared to farmers' pest management practices in which crop suffered with stem borer (5.14%), leaf folder (7.68%), grass hopper (4.53%); brown spot (7.32%), sheath blast (10.24%), BLB (5.63%) and false smut (6.21%) (Fig. 1). IPM module was also compared with the conventional practices, where calendar based pest management strategies were followed.

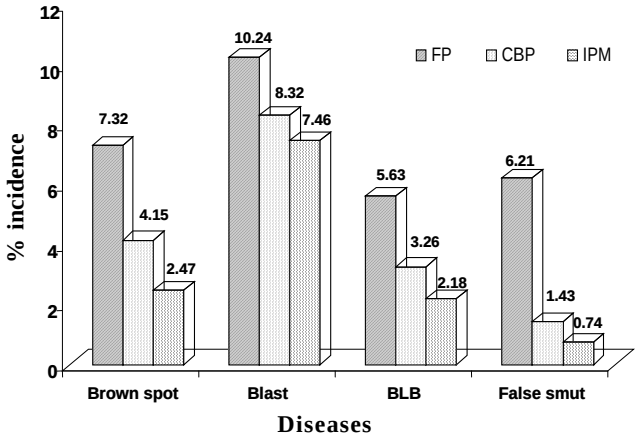

Fig 1. Major diseases of Basmati rice in different treatments

In CBP, though there was reduction in pest incidence, in the same way there was decrease in natural enemies' population compared to FP. Among the natural enemies prevalent in Basmati rice ecosystem, predators like damselfly, *Agriocnemis pygmaea*; ground beetles; wolf spiders, *Lycosa pseudoannulata* and parasitoids like *Apanteles* sp., *Telenomus* sp., *Brachymeria* sp., *Tetrastichus* sp., *Stenobracon* sp., *Xanthopimpla* sp. were observed in appreciable number (Fig. 2). In all, the population of natural enemies was higher in IPM plots compared to CBP and FP plots where higher doses of chemical pesticides applied which is in agreement with Pathak *et al*. (2002) and Dani *et al*. (2003). Singh *et al*. (2003) claimed cartap hydrochloride to be safe to egg parasitoid, *Telenomus dignoide* of yellow stem borer with the maximum egg parasitism of 62.3-81.6% compared to carbofuran (40-59%) and phorate (33-54%). The present findings are in accordance with the results of Singh *et al*. (2003).

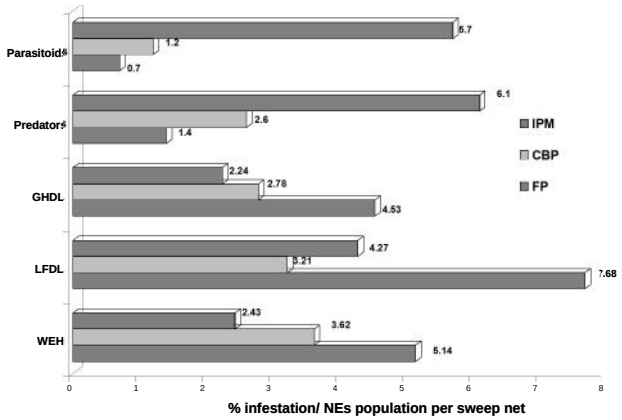

Fig 2. Major insect pests and their natural enemies in different treatments

The IPM plots recorded highest yield of 4.6 t ha^{-1} in comparison to FP (3.1t ha^{-1}) and CBP (4.4 t ha^{-1}). Looking to the economics, the highest cost benefit ratio was recorded in IPM (13.16) followed by CBP (12.92) and FP (2.84). These results emphasizes the need to spread the adoption of IPM among Basmati rice growers.

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