

Role of Plant Diagnostic Laboratory for Identification and Management of Insect Pests of Paddy in Kapurthala District

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Abstract

Paddy is grown under different agro-climatic conditions and the crop is damaged by more than 100 species of insect pests and infested by varied diseases. These insect pests cause enormous grain yield losses, which may vary from 20 to 50 per cent if not managed in time. During the last 3 years i.e. from 2013 to 2015, a record of all the visiting farmers was maintained in the plant health diagnostic laboratory at the Krishi Vigyan Kendra, in which complete details of the farmer with address and contact number was maintained. It was noticed that majority of the farmers (80.5%) visited during the month of April and only 19.5 per cent visited in the month of May as sowing of paddy nursery starts from the first week of May every year. The crop was also found to be prone to micro nutrient deficiency and showed deficiency symptoms in iron and zinc. It was inferred that before the sowing and harvesting of the crop, the farmers queries were maximum due to the fact that majority of insect pest attack takes place near maturity of the crop which results in huge loss, if not taken seriously. As Krishi Vigyan Kendra imparts short duration training to farmers from time to time, it can be concluded that KVK staff should provide training relating to the above mentioned technological problems in a particular month.

Keywords: Seed Treatment, Sheath blight, Leaf folder, sucking insect pests, micro nutrient, paddy, basmati.

Introduction

Paddy cultivation is best suited to regions of high temperature, high humidity, prolonged sunshine and assured water supply. A temperature range of 20 to 37.5°C is required for its optimum growth. The crop requires a higher temperature at tillering than during early growth. The temperature requirement for blossoming ranges between 26.5 and 29.5°C. The humidity needs vary according to the variety. For early types, the favourable range of humidity is 83 to 85 per cent and for the late ones, it is 67 to 68 per cent. In Punjab, the rice season extends from May to November. During the year 2014-15, paddy was cultivated in 28.94 lakh ha with

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total production of 166.61 lakh tonne of paddy. The average yield of paddy was 57.57q per hectare. Paddy is grown under different agro-climatic conditions and the crop is damaged by more than 100 species of insect pests and infested by varied diseases. These insect pests cause enormous grain yield losses, which may vary from 20 to 50 per cent if not managed in time.

It was noticed while working with farmers that in spite of tremendous progress made by the farmers of Punjab, there was still a wide gap between the potential of the technology and the results achieved by the farmers. Sharma (2015) reported major bottlenecks in the adoption of feeding practices by the dairy farmers in the district. Similarly, Singh (2013) indicated that most of the recommended brands of the pesticides were not available in the market. As a result, farmers were helpless in adopting the recommended spray schedule for the control of attack of various insect pests and diseases on various crops.

Every crop has its own complex of insect pests and diseases. The attack of insect pests and diseases is season specific. The same crop may be attacked severely by one insect pest or disease in one year and in another year some other insect pest or disease may be prevalent on the same crop in severe form. At the same time, attack of one insect pest in severe form may occur year after year on the same crop as is the case of attack of white-fly on cotton in the *Malwa* belt during the year 2015 and 2016.

Therefore, it was planned to ascertain the areas in which farmers made most of the queries so that the Kendra could make changes in the action plan for the benefit of maximum number of farmers. Hence the study was conducted to classify the data pertaining to number of farmers who visited the plant disease diagnostic laboratory at the KVK to get the paddy samples diagnosed for the attack of insect pests and diseases and its probable remedial measures.

Materials and Methods

During the last 3 years *i.e.* from 2013 to 2015, a total of 606 farmers from different villages and blocks of Kapurthala district visited the Plant Disease Diagnostic Laboratory established at the Krishi Vigyan Kendra, Kapurthala. Of these, 299 farmers visited regarding wheat and other *Rabi* oilseed crops, 95 for vegetables and fruit cultivation and 212 farmers for paddy and basmati cultivation. From the data analysed, a gradual increase in the number of farmers' visits was envisaged during the study period. A record of all the visiting farmers including complete details of the farmer with full address and contact number was maintained. Similarly, the

purpose of visiting the KVK was recorded date wise by the KVK scientist and at the end of each month, a summary was prepared and analysed for severity of the attack of insect pests and diseases. The data were classified month wise, problem wise, crop wise *etc.* to note down the extent of damage caused by the insect pests, diseases or other agencies. The probable solution of the problem diagnosed was given to the farmer.

Results and Discussion

Month wise farmers visit at KVK

Data showed that out of 168 farmers who visited the KVK, per cent values for the months of April, May, June, July, August, September and October were 19.6, 8.3, 4.2, 14.3, 22.0, 22.6 and 8.9 per cent, respectively (Table 1). It is inferred that before the sowing and harvesting of the crop, the farmers queries were maximum due to the fact that majority of insect pest attack takes place near maturity of the crop which results in huge loss, if not taken seriously.

Table 1. Month wise Farmers visit to KVK (average of 3 years) for solving their Technological Problems in Paddy

Sr. No.	Crop - Paddy	April	May	June	July	Aug	Sept	Oct	Per cent Farmers
1	Seed treatment of paddy	80.5	19.5	0.0	0.0	0.0	0.0	0.0	24.4
2	Sheath blight	0.0	0.0	0.0	13.3	40.0	46.7	0.0	17.9
3	Attack of Leaf folder	0.0	0.0	0.0	25.0	46.4	28.6	0.0	16.7
4	Attack of brown plant hopper	0.0	0.0	0.0	0.0	36.0	20.0	44.0	14.9
5	Iron deficiency in paddy	0.0	0.0	60.0	40.0	0.0	0.0	0.0	6.0
6	Iron deficiency in nursery plot	0.0	85.7	14.3	0.0	0.0	0.0	0.0	4.2
7	Attack of stem borer	0.0	0.0	0.0	50.0	12.5	37.5	0.0	4.8
8	Sheath rot	0.0	0.0	0.0	50.0	16.7	33.3	0.0	3.6
9	Empty panicles due to wind storm	0.0	0.0	0.0	0.0	0.0	50.0	50.0	2.4
10	Zinc deficiency	0.0	0.0	0.0	66.7	33.3	0.0	0.0	1.8
11	Attack of grasshoppers	0.0	0.0	0.0	0.0	0.0	50.0	50.0	2.4
12	Attack of brown spot disease	0.0	0.0	0.0	0.0	0.0	100.0	0.0	1.2
Total		19.6	8.3	4.2	14.3	22.0	22.6	8.9	100.0

Seed Treatment

A total 168 farmers visited the KVK with queries pertaining to the paddy crop during April to October in which 24.4 per cent of the farmers enquired about seed treatment in Paddy (Table 1). It is a known fact that seed is treated to give the plant, protection against attack of bacterial leaf blight and other soil borne diseases. It was observed that farmers were unaware about the name of the chemical to be used, its quantity and method of application.

Further, normally farmers use 10 to 12.5 kg of paddy seed but recommendation is for 20 kg to sow one hectare of area. Similarly, for seed treatment, the recommendation is to use 12.5 g of Emisan-6 + 2.5 g of Streptocycline in 25 L of water and to keep the 20 kg paddy seed in this solution for 6-8 hours. Hence, farmers wanted to know whether 25 L prepared solution would be sufficient for 10 kg seed or whether they would have to reduce its quantity by half (because they would use only 10 kg seed). Likewise, whether the prepared solution can be used to treat the second lot of seed or would they have to prepare the fresh solution time and again for treating the new lot.

It was also noticed that majority of the farmers (80.5%) visited during the month of April and only 19.5 per cent visited in the month of May due to the reason that sowing of paddy nursery starts from the first week of May every year as per Punjab Government notification. Later on, no farmer enquired about seed treatment in paddy.

Sheath Blight

About 30 farmers (17.9%) came to the KVK with plant samples (Paddy) infested with sheath blight (*Rhizoctonia solani*). Symptoms of the disease were greyish green lesions with purple margin developed on the leaf sheath above the water level. Later, the lesions enlarge and coalesce with other lesions. Farmers noticed this disease in the month of July (13.3%) but maximum number of samples were diagnosed in the month of August (40%) and September (46.7%). The probable reason could be that although the disease started appearing in the field in the month of July but the symptoms were usually not distinct till flowering, hence more number of samples were brought by the farmers in the month of August and September.

Farmers use Tilt 25 EC @ 500 ml/ha to control this disease as and when its symptoms appear in the field. Tilt 25 EC being broad spectrum in nature, takes care

of other diseases also particularly brown spot disease and sheath rot. This may be the reason why only 6 (3.6%) and 2 (1.2%) farmers brought samples infested with sheath rot and brown spot disease, respectively.

It was also found that farmers generally use 100 L of water for spraying the fungicide whereas the recommendation is to use 200 L of water in order to give complete coverage to all the parts of the plant which results in good control of the disease. Due to the fact that farmers were using less water for spray of fungicides this resulted in partial control of the disease and hence the disease reappeared in the field and the farmer had to apply one or two more sprays of the fungicide which increased his cost of cultivation.

Leaf folder

The third problem faced by the farmers was the attack of leaf folder *Cnaphalocrocis medinalis* (Guenee) and stem borer, *Scirpophaga incertulas* (Walker) during July to September as 28 farmers visited the KVK with samples (16.7%) infested with the attack of leaf folder and 8 farmers (4.8%) with the attack of stem borer. Stem borer larvae feed inside the stem causing drying of the central shoot or dead heart in young plants and drying of the panicle or white ears in older plants. As paddy varieties suffer less damage due to stem borer, this may be the reason for less number of samples diagnosed with attack by this pest. Farmers generally go for granular application of insecticides for the management of this pest at 30, 60 and 90 days after transplanting which is effective but not economical, while spraying with any of the recommended insecticides proves both efficient as well as economical. Farmers must go for spray when the damage reaches 10 per cent Economic Threshold Level for leaf folder and 5 per cent for stem borer with 170 g of Mortar 75 SG (cartap hydrochloride) or 350 ml of Sutathion 40 EC (triazophos) or 560 ml of Monocil 36 SL (monocrotophos) or 1 litre of Coroban/Dursban/Lethal/Chlorguard/Durmet/Classic/Force 20 EC (chlorpyrifos) in 100 litres of water per acre.

Attack of Sucking Insect Pests of Paddy

Two insects i.e. brown plant hopper (*Nilaparvata lugens*, Stal) and white backed plant hopper (*Sogatella furcifera*, Horvath) are most important. Maximum number of farmers (25 farmers) brought samples (14.9%) infested with the attack of brown plant hopper during August to October months. Its nymphs and adults suck cell sap from the leaf surface and tend to congregate on the leaf sheath at the base

of the plant. The attacked plants ultimately dry up without producing ears. The attack appears in patches. The samples were received in the months of August (36%), September (20.0%) and October (44.0%). Maximum number of samples were diagnosed in the month of October due to the reason that farmers usually prefer Pusa 44 variety in rice-wheat crop rotation which is of long duration and matures in the month of October. By this time, brown hopper shifted from all other short duration varieties harvested in the last week of September to first week of October, to this variety and resulted in more number of samples during October. The suggested control measure is by spraying 40 ml Confidor 200 SL / Crocodile 17.8 SL (imidacloprid) or 800 ml Ekalux/Quinguard 25 EC (quinalphos) or one litre Coroban/Dursban 20 EC (chlorpyrifos) in 100 litres of water per acre which should be repeated if required. For better effectiveness, spray should be directed towards the base of the affected plants. If the damage is noticed at hopper burn stage, the affected spots should be treated along with their 3-4 metre periphery immediately as these spots harbour high population of the insect.

Occurrence of Micro Nutrient Deficiency

The paddy crop was also found to be prone to micro nutrient deficiency. Iron and zinc were two nutrients to which the crop showed deficiency symptoms. Seventeen farmers (10.2% sample) came to the KVK showing iron deficiency in the samples and 3 farmers (1.8 per cent sample) brought samples found to be zinc deficient. These deficiency symptoms occurred in soils which were of light texture. The difference in the number of samples received of these two nutrients might be due to the fact that the farmer has included the application of zinc sulphate @25kg/ha at the time of puddling the field in his farming practice and hence its deficiency did not appear. The symptoms of zinc deficiency appear on lower leaves becoming rusty brown near the base and ultimately dry up.

The seedling with zinc deficiency remain stunted and tiller less. The farmers used 62.5 kg of zinc sulphate hepta hydrate (21%) or 40 kg zinc sulphate monohydrate (33%) per hectare at puddling. Hence, only 1.8 per cent farmers visited the KVK for the control of this malady and that too in the month of June (66.7%) and July (33.3%) as the symptoms of zinc deficiency appear 2-3 weeks after transplanting. This was not the case with iron deficiency. Farmers apply iron sulphate as and when its deficiency occurs in the field. In case of iron deficiency, chlorosis among seedlings appears in the youngest leaf about three weeks after transplanting. The plant dies and often the crop fails completely. The recommendation is to give 2

or 3 sprays of one per cent ferrous sulphate solution as soon as chlorosis appears. Hence, 10.4% farmers visited in the month of July and August as the symptoms of iron deficiency also appear 2-3 weeks after transplanting.

Sometimes heavy winds cause damage to the paddy crop particularly when the crop is at its reproductive stage. As and when the wind blows, it results in damage to the pollens and ultimately fertilisation is affected. This results in no grain filling and hence empty panicles. Four farmers with 2.4% samples visited the KVK with this problem.

Minor Insect Pests

Some minor insect pests particularly grasshoppers also attack the paddy crop but its attack remains confined to the peripheral region of the crop and does not go deep in the field. It becomes a pest particularly when there is no other crop to feed for this insect near the paddy and also when the bunds are kept clean of grass. This may be the reason that only 4 farmers with 2.4% samples came in the months of September and October.

Problems related to Basmati crop

The problems pertaining to basmati crop were more or less similar to paddy crop. In case of basmati, a total 44 farmers visited the KVK during April to September and 28 farmers (63.6%) to know about seed treatment (Table 2). The basmati seed is treated to give the plant, protection against foot rot disease caused by *Fusarium moniliformae* and it was found that farmers were not aware about the name of the chemical to be used, its quantity and method of application like that of paddy crop.

The foot rot disease is both seed and soil borne. The infected seedlings turn pale yellow and become elongated. Later on these seedlings start drying from the bottom and ultimately die. Regarding its management, treatment of both the seed and seedlings is important. The recommendation is to dip the seed in 50 g of bavistin + 2.5 g streptocycline dissolved in 25 L of water for 12 hours and seedling root dip in bavistin for 6 hours before transplanting. It was noted that most of the farmers generally go for seed treatment but did not perform seedling treatment. Secondly, the farmers who performed seedling treatment, did not remove mud from the roots and kept the seedlings in prescribed solution as such, which is not a good practice. For proper management of the disease, use of disease free seed, treatment of the seed as well as seedling and destruction and rouging out of the infected seedlings from nursery and field is necessary.

Table 2. Month wise Farmers visit to KVK (average of 3 years) regarding Basmati crop

Sr. No.	Crop - Basmati	Apr	May	June	July	Aug	Sept	Per cent farmers
1	Seed treatment	21.4	32.1	46.4	0.0	0.0	0.0	63.6
2	Foot rot in nursery plot	0.0	0.0	100.0	0.0	0.0	0.0	2.3
3	Foot rot	0.0	0.0	0.0	20.0	40.0	40.0	22.7
4	Iron deficiency in basmati nursery	0.0	0.0	100.0	0.0	0.0	0.0	4.5
5	Iron deficiency in basmati	0.0	0.0	0.0	100.0	0.0	0.0	2.3
6	Attack of stem borer	0.0	0.0	0.0	0.0	100.0	0.0	2.3
7	Attack of Brown spot	0.0	0.0	0.0	0.0	0.0	100.0	2.3
	Total	13.6	20.5	31.8	11.4	11.4	11.4	100.0

Farmers fail to follow these steps at one or other level and thus the disease appears which was evident from the record as maximum number of farmers visited the KVK for the seed treatment of basmati rice and 22.7 per cent samples were found infested with foot rot disease. Further, two varieties namely Pusa basmati 1121 and Pusa basmati 1509 were found to be most susceptible to this disease.

Nutrient Deficiency Symptoms

The basmati crop was found to be prone to iron deficiency only. Only 2 farmers (9% sample) brought samples showing iron deficiency. The symptoms of deficiency and other problems related to this micronutrient were the same as in paddy (Table 2).

It is a known fact that basmati varieties are more prone to the attack of stem borer, but only one farmer (2.3% sample) visited the KVK regarding its management. The probable reason could be that it is grown on a much lesser area as compared to paddy in the district. Secondly, farmers generally apply granular insecticide which takes care of the stem borer. Thirdly, the attack of stem borer is not appearing in a severe form since the last 4-5 years. Further, basmati seems to be susceptible to the attack of brown spot disease and only one farmer came regarding its management. Compared to the paddy crop, situation for basmati crop was comfortable.

Conclusion

The main objective of the Kendra is to help the farmers in the command area in the field of agriculture and allied sectors so that the income of the farmer from the farming sector can be enhanced to a great extent by making available recommended technologies at his door step for its adoption at the field level. The study indicated that the farmer is always in need of some specialist working in various institutions for the management of those insect pests or diseases or nutritional deficiencies which are difficult to control at his own level or at pesticide dealer level. The samples brought were of utmost importance in diagnosing the cause and remedy of the problem, where the help of the concerned scientist was required. As Krishi Vigyan Kendra imparts short duration training to farmers from time to time, it can be concluded that KVK staff should provide training relating to the above mentioned technological problems in a particular month.

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