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Status of bacterial blight of common beans (*Phaseolus vulgaris* L.) in Kashmir

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Abstract

The present study was conducted in SKUAST-K, Srinagar during 2010, and investigations revealed that Common Bacterial Blight was prevalent in all bean growing areas with disease incidence and intensity ranging from 38.55 to 47.69 per cent and 15.05 to 23.84 per cent, respectively. The highest disease incidence of 42.72 per cent and intensity of 23.80 per cent was observed in district Srinagar, while at least incidence and intensity of 39.89 per cent and 17.69 per cent was observed in district Bandipora. Based on the DMRT, the disease intensity and severity recorded were statistically significant across all experimental locations. Symptomatic expression of disease was recorded on leaves, pods, stem, petioles and seeds. Disease initially manifested as minute water-soaked spots on underside of the leaves which gradually enlarged. Later resulting in the coalescing of enlarged spots into brown necrotic patches. The symptoms on pods initially appeared as small water-soaked spots which later enlarged into reddish brown spots and were slightly sunken with raised edges. Symptoms on stem and petiole were initially reddish brown spots, which enlarged along their length in the form of longitudinal streaks. In case of severe infection the streaks girdled the stem. Irregular blotches of various sizes were observed on diseased seed. Such seeds were smaller and appeared dull. Host range studies of bacterium revealed that it successfully infected mung bean, pea, cowpea, lentil, soybean, moth bean, snap bean and lima bean under conditions of artificial inoculation. Infected seeds could harbour the pathogen beyond the next sowing season. The viability of pathogen on infected seeds decreased with time.

Keywords: beans, incidence, intensity, Kashmir, *Phaseolus vulgaris*

1. Introduction

In India *Phaseolus vulgaris* L. cultivation over on 8.0 million hectares with an annual production of 3.2 million tons [1]. This green legume crop is of worldwide significance for direct human consumption and for the dietary supplement as it is rich in proteins, vitamins and minerals such as calcium, phosphorus, iron and zinc [2]. It is the premier green legume crop of Jammu and Kashmir where its cultivation is mainly confined to rainfed and *Karewa* areas covering an area of about 26.75 thousand hectares with an annual production of 14.2 thousand metric tons [3]. Kashmiri Rajma is a prized commodity throughout northern India and is valued as *Dal* for its taste and colour. As vegetable crop, French bean is grown in Kashmir over an area of 2000 ha with an annual production of 400 metric tonnes [4]. Legumes play an important role in human diet and edible bean (*Phaseolus vulgaris* L.) is one of the most important crops in the world owing to its high commercial value, extensive production, consumer use and nutrients like carbohydrates, proteins, minerals and vitamins. It is traditionally a basic food crop in many developing countries, and serves as a major plant protein source for rural and urban areas [5]. Beans are a key source of proteins, with high contents of lysine and methionine, the dry pulse bean has 22% protein, while the green snap bean has 6.1% protein, and are increasingly being consumed as an alternative to animal protein by low income families in developing countries as immature green pods or as dry pulses [6]. Diseases are important constraint in cultivation of common bean, which are affected by many fungal, bacterial and viral diseases. Common bacterial blight caused by *Xanthomonas campestris* pv. *Phaseoli* (Smith) Dowson is a serious seed borne disease of beans in both temperate and tropical zones, which drastically reduces the yield of crop [7]. The disease is a worldwide problem in bean production and may be highly destructive during extended periods of warm, humid weather, resulting in yield losses and reduction in seed quality through discolouration of infected seed [8]. Yield losses in beans due to common bacterial blight are estimated to range between 10-40 per cent in susceptible genotypes [9].

Materials and Methods

Status of disease

A brief survey of important bean growing areas of valley was conducted for assessing the incidence and intensity of common bacterial blight of beans during May to June, 2010. Three major bean growing areas were randomly selected in Bandipora, Anantnag and Srinagar districts of Kashmir Valley. From each district, three locations were selected and from each location three fields were randomly selected for recording the observation.

Disease incidence

Disease incidence was determined after quadrates of 2 m x 2 m size were laid at random at three places in each of the selected fields. Plants in each of these quadrates were kept under observation for common bacterial blight symptoms to

Disease category based on leaf infestation

Numerical category leaf area Damage

Scale	Disease Range
0	Disease free
1	0.1- 10.0
2	10.1- 25.0
3	25.1- 50.0
4	50.1- 75.0
5	> 75

$$\text{Disease intensity} = \frac{\text{Numerical ratings}}{\text{Total number of leaves counted}} \times \frac{x}{100} \times 5$$

Symptomatological studies

The symptoms of the disease were studied on various organs of diseased bean plants maintained for continuous monitoring of disease development at all experimental fields. These plants were not given any treatment throughout the season to control the disease. Besides this, the diseased plant organs collected from different localities were also critically examined in the laboratory for recording the symptoms on leaves, pods and stem.

Results and Discussion

It is evident from the survey conducted during May and June, 2010 that common bacterial blight is more or less prevalent in

record incidence of disease. By treating plant as a unit of study, number of plants with disease symptoms on leaves out of total number of plants studied was recorded to work out the disease incidence by adopting the formula: Where n is the number of plants showing common bacterial blight infection and N is the number of plants in each quadrate. Average of three quadrates represented a field and average of three fields represented the respective localities.

Disease intensity

Disease intensity was calculated for a sample of 30 plants, selected randomly by drawing numbers from random table. Leaves from each plant were individually observed for common bacterial blight symptoms and rated according to the following scale (Plate-1) given by Dursun *et al.* [5] after slight modification.

almost every bean growing field of Kashmir with varied incidence and intensity from place to place. Since the literature did not reveal any reference of the disease, pertaining to the Jammu and Kashmir state, the present investigation seems probably to be the first report of the disease from Jammu and Kashmir. Nine locations were surveyed and the highest incidence and intensity of the disease was observed in Shalimar area Srinagar, followed by Ashajipora (Anantnag), Markundal (Bandipora), Noorbagh (Srinagar), Dialgam, Bijbehara (Anantnag) and Garoora (Bandipora), respectively. Comparatively less disease was recorded at other places. High disease incidence and intensity at Shalimar area may probably be attributed to the higher relative humidity (RH %) of that area. Variations in incidence and intensity of common bacterial blight of common bean growing areas of the world, also been reported by some other workers [10, 11, 12, 13, 14, 15, 16].

Table 1: Incidence and intensity of common bacterial blight of beans (*Phaseolus vulgaris* L.) in Kashmir valley 2010

District	Location	Disease incidence (%)	Disease intensity (%)
Anantnag	Ashajipora	45.08 ^b	22.02 ^c
	Dialgam	40.58 ^b	20.93 ^b
	Bijbehara	39.95 ^a	18.21 ^a
	Mean	41.87	20.38
Bandipora	Markundal	41.30 ^b	19.76 ^c
	Gorora	39.84 ^a	18.26 ^b
	Sumbal	38.55 ^a	15.05 ^a
	Mean	39.89	17.69
Srinagar	Shalimar	47.69 ^c	23.84 ^c
	Habak	39.71 ^a	17.02 ^a
	Norbagh	40.91 ^b	18.75 ^b
	Mean	42.77	23.80
Overall mean		41 0.51	2 0.63

*The superscript letters on the numerical figures represent their level of significance at 5% of level by Dunkens Multiple Range Test (DMRT)

Table 2: Symptomatology of common bacterial blight of beans (*Phaseolus vulgaris* L.)

Symptoms	Shape and size	Colour
Initially appeared as small water soaked spots on the underside of leaves, which became flaccid and later turned necrotic, surrounded by a narrow zone of lemon-yellow tissue.	Irregular shape, which enlarged to 10 mm or greater.	Yellowish brown but later turned to dark brown
Initially water-soaked spots are formed which enlarge to form sunken lesions with raised edges. Early pod infection resulted to yield small, shrivelled and discoloured seed	Circular to irregular	Dark green which later changed in reddish brown in colour.
Symptoms on stem and petiole are initially circular spots which later enlarged along their stem and petioles in the form of longitudinal streaks. In some cases of severe infection, the stem was girdled by these spots.	Streaks were found longitudinal with varying width	Initially reddish brown and later turned dark brown.
Diseased seeds were wrinkled and smaller than healthy seeds and had a dull appearance.	Irregular and small blotches of various sizes.	Seeds had yellow coloured spots at the hilum.

During the present investigation, symptoms of disease were observed on leaves, stem, petioles, pods and seeds. The periodical observations of the disease revealed that the symptoms first appeared in the month of May as small water-soaked spots on lower sides of the leaves which gradually enlarged, became flaccid and later turned brown to necrotic, often surrounded by a narrow zone of lemon- yellow tissue. The lesions enlarged to 10 mm or greater, while in case of severe infection of disease the leaflets were killed and premature defoliation occurred. Similarly, the symptoms of the disease on pods initially appeared as small water-soaked spots and later these spots enlarged into reddish brown lesions in colour. On stem and petioles, the symptoms of the disease first appeared as longitudinal lesions reddish brown in colour. After sometime, these lesions were enlarged along the stem and petiole in the form of longitudinal streaks of brown colour. The symptoms of disease on seed produced yellow, irregular blotches of various sizes and diseased seeds were smaller than healthy seeds. Observations also revealed that seeds were wrinkled and had dull appearance. From the mid June onwards, the leaves turned yellow indicating that there was accelerated loss of chlorophyll from infected leaves. The symptoms as observed during present investigations resemble the common bacterial blight of beans already reported by other workers [8, 17, 18, 19].

Summery and conclusion

In Kashmir valley the Common Bacterial Blight is prevalent in bean growing areas with considerable disease incidence and intensity. The highest disease incidence and intensity was observed in district Srinagar, while as lowest of it were observed in district Bandipora. The disease intensity and severity recorded were statistically significant, and the symptomatic expression was recorded on leaves, pods, stem, petioles and seeds.

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