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Field evaluation of onion germplasm for resistance to purple blotch under cold arid conditions of Ladakh

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Abstract

Onion (*Allium cepa* L.) is one of the major bulb crop of India. Onion is most widely cultivated species of genus *Allium* and it belongs to family Alliaceae. It is having various uses such as vegetable, spice and as a medicine, so it is rightly called as “queen of kitchen”. An experiment was conducted to identify promising varieties of onion suited for cultivation under cold arid conditions of Leh, Ladakh during the kharif season of 2018. The main objective of the experiment was to evaluate the different varieties of onion against purple blotch under arid hill conditions of Leh, Ladakh. Treatments were eight onion varieties, namely Yellow Globe, Onion red, Rosa bella, Brown Spanish, Bhima Shakti, Local, Pinnari and Red Coral with three replications. The study revealed that under natural epiphytotic conditions only one genotype i.e., Red coral exhibited resistant reaction while Yellow globe, Onion red, Rosa Bella, Brown Spanish, Bhima Shakti, Local, and Pinnari were moderately resistant to purple blotch of onion.

Keywords: Purple blotch, allium cepa, genotypes, resistant, Alliaceae, onion

Introduction

Onion (*Allium cepa*) belongs to the family Liliaceae, an important group of crops worldwide (Best 2000) [2]. Onion is grown in temperate (Brewster, 1990) [3], sub-tropical (Corgan and Kedar, 1990) [5] and tropical climate (Currah and Proctor, 1990) [7] throughout the world. Onion also known as “queen of kitchen” is one of the oldest known and important high value spice cum bulbous vegetable crop cultivated throughout India (Ritesh *et al.* 2017) [12]. Onion is one of the oldest bulb vegetables in continuous cultivation dating back to at least 4000 BC (Ahmad *et al.* 2008) [1]. Onions are grown mainly as food materials however; onion has medicinal properties and has been used for the treatment of various ailments such as skin diseases, ear pain, heart attack and strokes. The bulbs are boiled and used in soups and stews, fried or eaten raw in salads. Although its main role in cooking is to provide flavor, onion is a significant source of vitamin C and potassium, contains about 60 calories in a medium-sized bulb, and has very low sodium content. It is cultivated year round but maximum during *Rabi* season in our country. In cold arid region where topography has considerable variation, onion cultivation is possible only in lower and central agricultural zones but it may be grown in upper agricultural zone on small scale under protected conditions inside the trenches or poly houses for vegetable purposes. The crop is grown for variety of purposes from kitchen to factory made products/food and also for dehydration. It is valued for its distinct pungent flavour and its essential ingredients cuisine. It is consumed round the year by all the section of people throughout the world due to healing properties of onion in case of cardiac diseases, rheumatism, cancer, digestive disorders, blood sugar and prolong cough. It is a photo sensitive crop and on the basis varieties are divided into short day and long day types. Long day types are high yielder but have poor shelf life whereas short day types have better shelf life with low yielding capacity. Though India produces a significant quantity of onion is not regular and sufficient enough to meet the demands of both domestic requirement and export. Amongst the onion producing countries in the world India ranks second in area and production, the first being China. Even though India ranks second in area under onion in the world and third in production but its productivity is low as compared to world’s productivity. Among several factors, diseases are the most important factor associated with low productivity in onion. Onion is susceptible to numerous foliar, bulb and root pathogens that reduce yield and quality (Cramer, 2000) [6].

Onion occupies an important place in the economy of cold arid region of Ladakh owing to the fact that high onion productivity is possible and farmers can earn a lot of money by supplying the produce to the market over a long period of time either green as vegetable or mature bulbs after storing for sometimes. In winter when no fresh vegetables are available in Ladakh, onion can be taken out of store houses for regular consumption or supply to the market. Purple blotch disease of onion is a serious menace in onion-producing countries of the world (Pandotra, 1965) [10]. Purple blotch is prevalent on leaves and seed stalk of onion and cause serious damage throughout the onion producing area in the country every year and due to this onion production is reduced which adversely affects exports and also results price hike within the country. Purple blotch of onion caused by *Alternaria porri* (Ellis) Cif. Is one among the serious fungal diseases that affect onion, causing heavy yield loss ranging from 2.5 to 87.8 per cent during kharif season (Srivastava *et al.*, 1994) [15]. Keeping in view of the above reason an experiment was carried out to identify the resistant genotypes against purple blotch of onion.

Materials and Methods

The experiment for evaluation of onion genotypes against purple blotch was conducted at experimental farm of High Mountain Arid Agriculture Research Institute Leh, Ladakh SKUAT-K during *kharif* season 2018 which is situated at an altitude of 3319 meter above sea level (masl). A total of eight onion genotypes were grown in randomized block design with three replications. The net plot size of 3x2m and spacing of 15x10cm was followed. Onion seeds were sown in the nursery beds on 14th of March 2018 under poly house and consequently transplanting was done on 15 of May 2018. The observations on disease intensity were recorded using 0-5 scale (Table 1) of (Sharma, 1986) [14] at four and half months after transplanting when the disease was developed to its maximum extent and percent disease index was calculated by the following formula given by (Wheeler, 1969) [16]. Further, the varieties were placed in different categories of resistance and susceptibility on the basis of method given by (Pathak *et al.*, 1986) [11]. All the observations recorded were analyzed for analysis of variance, critical difference (CD) and coefficient of variance (CV) in statistical package OP stat.

$$PDI = \frac{\text{Total sum of numerical ratings}}{\text{Number of observations}} \times \frac{100}{\text{Maximum disease rating}}$$

The details of 0-5 scale (Sharma, 1986) [14].

- 0 = No disease symptom
 1 = A few spots towards tip covering 10 percent leaf area.
 2 = Several purplish brown patches covering upto 20 percent of leaf area.

- 3 = Several patches with paler outer zone covering upto 40 percent leaf area.
 4 = Leaf streaks covering upto 75 percent leaf area or breaking of the leaves from center and
 5 = Complete drying of the leaves or breaking of leaves from center.

Table 1: Scale adopted to indicate degree of resistance against purple blotch of onion

Sl. No.	Disease severity	Category	Reaction
1	<5	0	Immune
2	5-10	I	Resistant
3	11-20	II	Moderately resistant
4	21-40	III	Moderately susceptible
5	41-60	IV	Susceptible
6	>61	V	Highly susceptible

Results and Discussion

The evaluation study of 8 onion genotypes conducted in the year 2018 under natural epiphytotic conditions against Purple blotch indicated that disease occurred on all the test cultivars (Tables 2 & 3, Fig. 1). However, analysis of data showed a differential response among the cultivars with regard to disease intensity.

Table 2: Reaction of onion genotypes against purple blotch of onion under field condition

Rating	Reaction	Genotypes/Varieties
0	Immune	-
1	Resistant (1-10%)	Red Coral
2	Moderately Resistant (11-20)	Yellow globe, Onion red, Rosa bella, Brown Spanish, Bhima shakti, Local and pinnari.
3	Moderately Susceptible (21-40%)	-
4	Susceptible (41-60%)	-
5	Highly Susceptible (>60%)	-

Table 3: Screening of onion varieties for disease resistance under field conditions

S. No	Varieties	Disease intensity (%)	Scale	Reaction
1	Yellow Globe	14.1	2	Moderately Resistant
2	Onion red	11.7	2	Moderately Resistant
3	Rosa bella	17.3	2	Moderately Resistant
4	Brown Spanish	17.5	2	Moderately Resistant
5	Bhima shakti	17.4	2	Moderately Resistant
6	Local	15.4	2	Moderately Resistant
7	Pinnari	13.9	2	Moderately Resistant
8	Red coral	9.0	1	Resistant
	Mean	14.53		
	CD	1.91		
	CV	7.43		

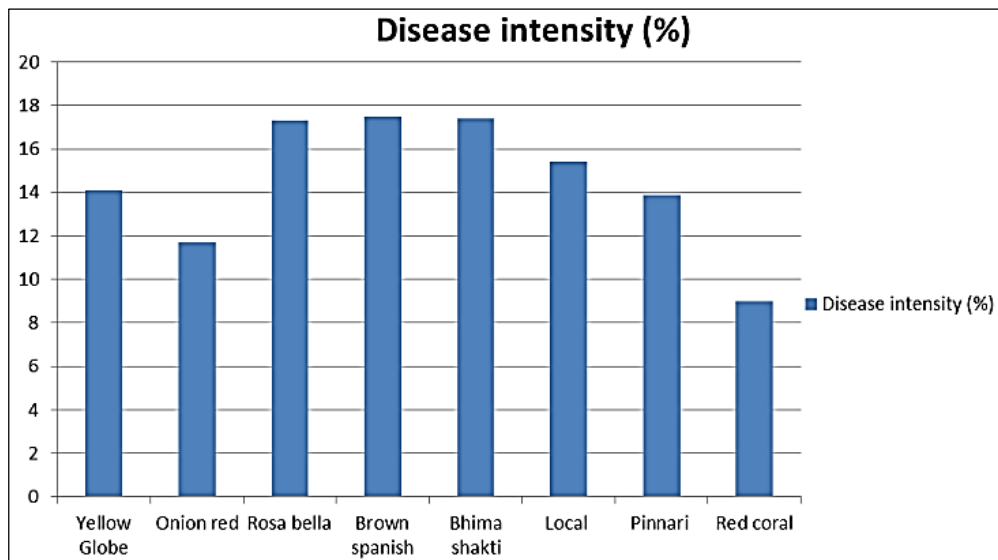


Fig 1: Evaluation of different genotypes of onion against purple blotch

Disease intensity

The results indicated that of the varieties tested only one genotype i.e. Red coral showed resistant reaction. The disease intensity among the varieties ranged between 9.0 to 17.5 per cent during the year 2018 (Table 3). The analysis of data indicated that most of the varieties evaluated were moderately resistant to the disease but there existed a significant difference in disease intensity among different varieties. Maximum disease intensity was recorded in the genotype Brown Spanish (17.5%), followed by Bhima Shakti with disease intensity of 17.4%. The least disease intensity was recorded in Red Coral (9.0%). The development of purple blotch resistance genotypes can be expected to increase profitability by reducing the amount of fungicides used to produce a crop. Similar results were observed by Ganie *et al.* 2018^[13] and Veeraghanti *et al.* 2017^[9]. Dhiman *et al.*, (1986)^[8] studied reaction of onion genotypes against purple blotch disease and found that off the 18 genotypes raised for bulb crop none was found to be resistant. Pathak *et al.*, (1986)^[11] found only one line IR-56-1 as resistant and five lines *viz.*, IHR-25, IHR-44, IHR-499, IHR-500 and Arka kalyan as moderately resistant. These results were in conformity with the results obtained by Chethana *et al.*, (2011)^[4] who screened different onion genotypes against purple blotch and revealed that the genotype Arka Kalyan was found moderately resistant while genotypes *viz.*, Rampur Rose, Agrifound Rose, Arka Pragati, Arka Niketan, Arka Pitamber and Arka Bindu was found moderately susceptible to the disease. Hence the moderately resistant and moderately susceptible varieties identified during the present investigation (Table 3) can be screened at different stages over locations and years to confirm their reaction to purple blotch so that promising genotypes/resistant donors can be identified and used in future breeding programs for the development purple blotch resistant varieties.

Conclusion

Among eight genotypes screened against purple blotch disease, only coral red was having least disease. Therefore coral red variety could be included in the category 1. Other varieties *viz.*, yellow globe, Onion red, Rosa bella, brown Spanish, Bhima shakti, local and Pinnari showed moderately resistant reaction and were included in category 2. Hence the moderately resistant accessions identified during the present investigation can be screened at different stages over locations

and years to confirm their reaction to purple blotch so that promising accessions/resistant donors can be identified and used in future breeding programs for the development purple blotch resistant varieties.

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