

## SCREENING AND EVALUATION OF ONION VARIETIES AGAINST FUNGAL DISEASES IN ONION (*ALLIUM CEPA*)

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### ABSTRACT

A field experiment was conducted on screening of varieties, against fungal diseases of onion (*Allium cepa*) during 2012-13 to 2014-15. Among 15 onion varieties tested, highest purple leaf blotch disease incidence (40.50) was recorded in Bellary Red and highest smut (24.50) and basal rot (35.66) disease incidence was recorded in Bhima shubra. In Agrifound Dark Red, recorded the highest yield (32.26t/ha), with the fresh weight of the bulb 157.58g., dry weight of the bulb 134.84 g., followed by Bhima Swetha (32.19t/ha), with highest fresh weight of the bulb (164.42g.) and Bhima Kiran (32.39 t/ha.) with highest dry weight of the bulb (148.84g). In Arka Kalyan, it was recorded less incidence of smut (10.55), basal rot (11.56) with good yield 21.50t/ha. In Arka Nikethan, it was recorded less incidence of smut (12.50), basal rot (13.56) with good yield 20.92t/ha, when compared to Bhima shubra.

**KEYWORDS:** Screening, Purple Leaf Blotch, Onion

### INTRODUCTION

Onion (*Allium cepa* L.) is a high value spice cum bulbous vegetable crop, cultivated in almost all parts of the country. In India, onion occupies an area of 0.52 million hectares, with the production of 6.50 million tonnes. Eventhough, India ranks first in area, under onions in the world and second in production, but its productivity is low (12.5 t/ha) as compared to worlds productivity (Anon., 2004), (Kappa Kondal, 2014).

Onion is one of the most import commercial vegetable, grown in India. In Andhra Pradesh, it is cultivated in an area of 36,100 ha, with production of 17.0 MT. Onion in mainly cultivated in Kurnool, Medak, Mahaboobnagar, Kadapa, Srikakulam and Guntur Districts. Kurnool ranks first in terms of acreage and productivity. There are no efforts made to study the diseases of onion varieties, in light soils of Kurnool. Hence, the present studies were taken up to screen the diseases of varieties in Kurnool.

Onion is cultivated throughout the year, in Kurnool district of Andhra Pradesh, India, which is one of the largest producing onion district. The area is more in Gonegandla, Kodumuru, C.Belagal, Veldurthi, Bethamcherla, Orvakallu and Nandikotkuru mandals. The most important varieties are Bellary red, Agrifound light red, N-53 and Orient hybrid. The constraints identified in the onion cultivation, in turn influenced the decreased area, production & productivity. The constraints are, the production of spurious seed, uneven bulb development, price fluctuations and diseases. Among several factors, diseases are one of the most important factors associated with low productivity in onion. Onion suffers from a number of diseases, such as leaf blight, downy mildew, purple blotch, basal rot, smut and white rot. Among which, Purple leaf blotch, caused by *Alternaria porri* is one among the serious fungal diseases that affect onion, causing heavy yield loss, ranging from 2.5 to 87.8 percent, during *kharif* season (Srivastava *et al.*, 1994. This disease

caused substantial loss of bulb and seed yield of onion growing countries (Ahmed and Hossain, 1985; Meah and Khan, 1987; Rahman *et al*, 1988). It is thus, a serious bottleneck in the cultivation of onion. Breeding programs have successfully used screening procedures, to develop intermediate and long day *Fusarium* basal rot (FBR) resistant cultivars (Christophen S. cramer, 2000). Root and basal rot disease of onion, *Fusarium oxysporum f.sp. cepa* (FOC) incidence in the greenhouse and field level, was tested in onion seed sets screening (Mehdi Nasr Esfahani, 2013).

Determination of suitable varieties of onion to Kharif and Rabi, and identifying pest and diseases is more essential for profitable cultivation and to know the best variety with good qualities. There were no efforts made, to study the diseases of onion varieties in light soils of Kurnool. Hence, it is essential to screen and evaluate onion varieties, against diseases in Kharif and Rabi, and the present studies were taken up to screen the diseases of varieties in Kurnool dt.

## MATERIALS AND METHODS

### Screening Studies

A field experiment was conducted at Horticultural Research Station, Mahanandi, Kurnool, (A.P.), to study the screening of onion varieties, against fungal diseases of onion, with 30x15cm spacing and 3x2 M plot size, during kharif 2013 and 2014. The experiment was laid out in Randomized Block Design (RBD), and the crop was raised by standard agronomic practices. The varieties tested are, Agrifound Dark Red, Agrifound Rose, Bhima Super, Bhima Red, Bhima Shubra, Bhima Shakthi, Bhima Kiran, Bhima Raj, Arka Kalyan, Arka Niketan, Arka Bindu, Arka Laliman, Arka Kirthiman, Co-on-5 and Bellary Red. The percent disease index (PDI), was recorded by using 0-5 scale (Sharma, 1986). 18 varieties were evaluated and recorded plant height, diameter, fresh weight, dry weight of the bulb and yield during kharif season, for suitability of the variety with low disease incidence.

### Evaluation Studies

18 onion varieties were studied for evaluating a suitable onion variety, with good yield and less disease incidence.

### Rating Scale for Assessment of Purple Blotch Disease

Observations were recorded at the first appearance of the disease symptoms on leaves, till the harvest at weekly intervals. The percent disease intensity was recorded by using 0-5 scale for onion, purple leaf blotch (Sharma, 1986) and smut diseases

**Table 1: The Details of 0-5 Scale (Sharma, 1986) in Onion Purple Blotch**

Grade	Description of the Symptoms
0	No disease symptom
1	A few spots towards tip covering 10 percent leaf area.
2	Several purplish brown patches covering up to 20 percent of leaf area
3	Several patches with paler outer zone covering up to 40 percent leaf area.
4	Leaf streaks covering up to 75 percent leaf area or breaking of the leaves from center
5	Complete drying of the leaves or breaking of leaves from center

The percent disease index of purple leaf blotch in onion was calculated, using the following formula:

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of the individual diseases grade}}{\text{No. of leaves observed X maximum disease grade}} \times 100$$

**Table2: Scale Adopted To Indicate Degree of Resistance Against Purple Blotch of Onion**

S. 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 DISCUSSIONS

The fungal disease reaction on screening of onion varieties was presented in Table– 3. None of the fifteen varieties screened against purple leaf blotch, was free from the disease. So, there is no variety registered in the category 0 and 1. Further, some varieties viz. Co-on 5, Arka Laliman, Arka Kirthiman, Arka Bindu, Arka Niketan and Arka Kalyan registered moderately resistant, by recording the disease intensity of 13.28, 14.28, 14.59, 16.59, 18.52, 19.56, respectively and grouped under moderately resistant category II. Smut disease incidence was less recorded in Co-on 5, Arka Laliman, Agrifound rose Arka Kirthiman, Arka Bindu, Arka Niketan and Arka Kalyan, Bhima Raj, Bhima Kiran, Bhima Shakthi and Bhima Super. Among the 15 Onion varieties, highest purple leaf blotch disease (40.50) was recorded in Bellary Red and highest smut (24.50), and basal rot (35.66) diseases were recorded in Bhima shubra. In Agrifound Dark Red, recorded the highest yield (32.26t/ha), with the fresh weight of the bulb 157.58g., dry weight of the bulb 134.84 g. followed by Bhima Swetha (32.19t/ha), with highest fresh weight of the bulb (164.42g.) and Bhima Kiran (32.39 t/ha.), with highest dry weight of the bulb (148.84g). In Arka Kalyan, it was recorded as less incidence of smut (10.55), basal rot (11.56) with good yield 21.50 t/ha. In Arka Nikethan, it was recorded as less incidence of smut (12.50), basal rot (13.56) with good yield 20.92t/ha, when compared to Bhima shubra. (Table-4)

Chetan *et al* (2011), screened eighteen genotypes against purple blotch disease and observed none of the varieties free from the disease. Therefore, no variety could be included in the category 0 & I. However, only one variety viz., Arka Kalyan registered moderately resistant, by recording a disease intensity of 18.59% and was grouped in moderately resistant category II

Dhiman *et al.*, (1986), studied the reaction of onion genotypes against purple blotch disease and was found that, of the 18 genotypes raised for bulb crop, none was found to be resistant.

Pathak *et.al.*, (1986), 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. Six varieties viz., Rampur Rose, Agri found Rose, Arka Niketan, Arka Pitambur Arka Pragathi and Arka Bindu exhibited moderately susceptible reaction and were included in category III. Nine Varieties viz., T-50/1, Gulbarga local, Marglobe White, Agrifound Dark Red T-112/1, T-100/1. White onion, Bijapur local and T-120/1, were rated as susceptible and included in category IV. The varieties Nasik Red and Bellary Local were highly susceptible and were included in category V.

Srujani *et al* (2013), reported that, twenty two onion varieties were tested during 2010-2012, at Kalyani, West Bengal, for evaluating their resistance levels against *A. Porri* and *S. vesicarium*, causal agents of purple blotch and stemphylium blight diseases, respectively, under field condition. Disease severity was recorded by using 5 point rating scale, when the disease was developed to its maximum extent and percent disease index was calculated. None of the 22 varieties, screened against purple blotch & stemphylium blight disease, was free from the disease. There were significant

variations, existing among the varieties under study. Results revealed that, only one variety viz, VG-18 performed best among all the tested cultivars, by displaying resistant and moderately resistance to purple blotch and stemphylium blight, respectively, while its comparative yield (288.18 q/ha) also remained on top. While, three varieties viz., NRCRO-4 (1168), Sel.157 and COLL-652 are susceptible, varieties VG-18 and VG-19 were found moderately resistant and remaining 17 were moderately susceptible, to stemphylium blight only.

Shahiduzzaman M, Abul Hossain N and Kundu D (2015) revealed that, out of twenty- one promising lines, Line G-54 was found moderately susceptible, line G-222 was moderately resistant and rest of lines, were found to be resistant against purple blotch. Lines G- 294, G-324, G-351, G-368, G-369, G-176 and G-189 were found resistant against stemphylium blight, lines G-299, G-192, G-4 and G-323 were found moderately resistant, lines G-222, G-54, G-213, G- 366 and G-264 were found susceptible, lines G- 52 moderate susceptible and G-266 were found susceptible.

Muhammad Saleem Jilani and Abdul Ghaffoor (2003), conducted a field experiment, to screen the performance of 10 varieties of onion under the agro-climatic condition, during 1999-2000. The varieties included Bannu Local, Bilot Kacha Local, Dark Red, Naurang Local, Peshawar Local, Paniyala Local, Phulkara, Shah Alam Local, Swat-I and Tank Local. Data on various growth parameters were recorded. Naurang Local and Peshawar Local, contained the maximum seedling bulb diameter of 0.5 cm and 0.49 cm, respectively, at the time of transplantation. The number of leaves of seedling plant-1 was the same in all varieties. Shah Alam, had the maximum number of leaves plant-1, leaf width and leaf length and number of leaves, before transplanting. The varieties did not show significant difference in bulb diameter and whorl of the leaf. Total number of double split-1 bulbs were maximum, in Bannu Local. The cultivars Naurang Local, possessed the maximum diameter (5.867cm), thick necked bulbs (226), weight of the bulb (104.2 g), yield plot-1 (14.75 kg).

## CONCLUSIONS

In screening studies of 15 onion varieties, highest purple leaf blotch disease (40.50) was recorded in Bellary Red. In Arka Kalyan recorded less incidence of smut (10.55), basal rot (11.56) with good yield (21.50t/ha). Highest smut (24.50) and basal rot (35.66) diseases were recorded in Bhima shubra. Agrifound Dark Red variety found to be suitable for Kurnool dt. And recorded highest yield (32.26t/ha) with fresh weight of the bulb (157.58g.), dry weight of the bulb (134.84g.) followed by Bhima Swetha (32.19t/ha) with highest fresh weight of the bulb (164.42g.) and Bhima Kiran (32.39 t/ha.) with highest dry weight of the bulb (148.84g.).

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## APPENDICES

Table 3: Screening of Onion Varieties against Fungal Diseases 2014-15

S. No	Name of the Variety	Fungal Disease Reaction		
		Purple Leaf Blotch(0-5 Scale)	Smut (0-5 Scale)	Basal Rot (%)
1	Agrifound Dark Red	24.28	11.28	12.55
2	Agrifound Rose	20.26	5.48	13.55
3	Bhima Super	24.12	13.48	22.55
4	Bhima Red	31.54	21.25	25.60
5	Bhima Shubra	30.58	24.50	35.66
6	Bhima Shakthi	25.29	15.69	14.50
7	Bhima Kiran	22.54	14.28	11.28
8	Bhima Raj	26.28	12.28	12.66
9	Arka Kalyan	19.56	10.55	11.56
10	Arka Niketan	18.52	12.50	13.56
11	Arka Bindu	16.59	11.55	12.50
12	Arka Laliman	14.28	2.5	5.58
13	Arka Kirthiman	14.59	6.55	3.55
14	Co-on-5	13.28	2.6	2.50
15	Bellary Red	40.50	13.50	29.55
	<b>CV</b>	<b>11.19</b>	<b>15.24</b>	<b>7.37</b>
	<b>CD 5%</b>	<b>2.33</b>	<b>1.73</b>	<b>1.01</b>
	<b>CD 1%</b>	<b>3.14</b>	<b>2.33</b>	<b>1.36</b>
	<b>SEm</b>	<b>0.80</b>	<b>0.60</b>	<b>0.35</b>

Table 4: Evaluation of Onion Varieties – 2013-14

S. No	Varieties	Plant Height	Stem Diameter	No. of Leaves	Diameter of Bulb (Cm)	Fresh Weight of Bulb (G)	Dry Weight of Bulb (G)	Yield (T/Ha)
1.	Agrifound Dark Red	39.20	4.40	14.60	19.50	157.58	134.84	32.26
2.	Agrifound Light Red	45.80	5.90	14.20	17.39	134.70	103.61	20.66
3.	Agrifound White	47.00	6.00	26.40	17.20	139.10	128.16	24.90
4.	Agifound Rose	28.40	3.18	09.80	08.70	52.52	47.42	09.86
5.	NHRDF Red L-28	50.40	6.40	18.00	17.50	130.82	109.60	23.60
6.	NHRDF Red 2-355	45.00	5.20	12.00	21.60	156.42	108.86	23.50
7.	NHRDF 3 L-652	49.80	5.30	11.40	22.80	146.56	129.92	26.19
8.	Bhima Raj	35.60	5.10	14.20	19.60	129.22	124.12	26.24
9.	Bhima Super	47.00	4.60	12.20	21.70	111.82	105.06	22.66
10.	Bhima Shakthi	43.20	5.00	13.80	18.30	135.52	126.10	27.33
11.	Bhima Swetha	52.80	5.40	17.80	18.61	156.22	147.94	32.19
12.	Bhima Kiran	50.20	7.40	15.60	17.74	164.42	148.84	32.39
13.	Bhima Shubra	36.20	4.60	12.40	17.95	131.87	122.53	25.84
14.	Bhima Red	44.00	6.20	13.20	17.20	140.54	128.60	27.90
15.	Arka Prgathi	32.24	4.20	10.20	14.38	97.58	84.58	18.70
16.	Arka Niketan	44.40	5.10	11.50	15.76	112.56	90.54	20.92
17.	Arka Kalyan	42.76	4.60	12.10	18.46	105.43	94.87	21.50
18.	N-2-4-1	44.80	5.60	11.60	19.80	119.92	108.12	23.35