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Suitability of high yielding Rabi Onion varieties for yield, pest and disease resistance for Bidar District

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Abstract

Onions (*Allium cepa*) are a cool-season crop that can be grown year-round in tropical and subtropical regions, requiring approximately 350 to 550 mm of water throughout their growth cycle. The optimal temperature range for growth and bulb development is (13°C) to 32°C). The normal rainfall of the Bidar district is about 850 mm and crop is grown in red, black and sandy soils. The onion yields were low due to long duration, short shelf life, high incidence of bolting and rotting during the crop growth period. ICAR-Krishi Vigyan Kendra (KVK), Bidar, UAS Raichur conducted the on farm trial on the assessment of the two Onion varieties for yield, pest and disease resistance at Nagoor cluster villages of Aurad taluka. The varieties used were Arka Bheem and Bhima Kiran against the local varieties for yield, pest and disease resistance. The study was conducted during 2024-25 to 2025-26 and the results revealed that Onion variety Arka Bheem and Bhima Kiran recorded higher Bulb yield of 292.85 q/ha and 310.35 q/ha as compared to the yield of 281.30 q/ha farmers practice (Local). Wherein, lower pest and disease resistance was recorded in two varieties as compared to the farmer's practice (Local). Higher Gross return and Net return were recorded in Arka Bheem and Bhima Kiran respectively as against farmer's practice (Local). The Benefit cost ratio (2.75 and 2.91) were recorded highest in Arka Bheem and Bhima Kiran as against the farmer's practice (2.66). Onion varieties Arka Bheem and Bhima Kiran were better option for the rainfed farming for higher yield and lower pest and disease resistance in Bidar district.

Keywords: Onion, Varieties, Pest and disease resistance

Introduction

India place world's second most largest producer of onion (*Allium cepa* L.) and China being at top followed by USA, Turkey, Pakistan, Iran, Indonesia, Vietnam and Myanmar. India produces about 13 per cent of total world's onion product and ranked second after China. In India 1.0 million hectare (mha), onion is grown with the production of 15.1 million tones (mt) and productivity of 14.2 t/ha¹. The overall onion export from India was 203 lakh tones (lt) in the year 2015-16. In India vegetable production occupies 10.5 percent and Maharashtra (28.9 %) placed highest in production. In Karnataka the total onion cultivation area is 1.90 lakh hectares with a production of 2.5 mt and productivity of 13.6 t/ha. In Bidar, agriculture is the main resource and it plays important role in the economic development of the district and has an area 14,329 ha with of onion production 49,529 mt (Shoba *et al.*, 2017) ^[2] and has 24 percent share of agriculture in GDDP (Gross District Domestic Product). However, with the advent of tropical varieties as well as adaptation of traditional varieties to climate change, the cultivation of cool season vegetables during winter season is gradually picking up in the plains of Karnataka during recent years. Trials on performance evaluation of rabi onion carried out by Krishi Vigyan Kendra, Bidar during 2024-2025 and 2025-26 found that the variety Arka Bheem and Bhima Kiran could come up well in the agro ecological conditions of the zone during the winter months of October – February. As there is dearth of information regarding the adaptability of onion varieties to the agro climatic situation in the Northern Eastern transition zone of Karnataka, a need was felt for screening varieties suitable to Zone, and hence the study was undertaken to assess the performance of various high yielding varieties of onion widely cultivated in other regions of India with the main objective of the study was to assess suitability of Onion varieties for yield, pest and disease resistance for Kalaburagi district through the on farm trials.

Materials and Method

On farm trial (OFT) was conducted at three farmers field of Nagur cluster villages during 2024-25 and 2025-26. Two genotypes of Onion varieties were selected for the experiment. After the harvesting of Greengram and blackgram crop in the month of August end the land was prepared and brought to the fine tilth with repeated harrowing. The land was free from weeds and clods were broken. The complete production technology was followed for raising the crop. The sowing was taken up in the first week of October-November with by hand sowing and nursery transplanting with seed rate of 2 kg/ha with spacing of 30x10 cm² for maintaining the optimum plant population. The soil was black loamy soil and samples were collected and analysed. Low organic carbon content (0.47%), low in nitrogen (276.4 kg/ha), high in phosphorus (31.70 kg/ha)

and medium in potassium (210.0 kg/ha) contents. The recommended dose of fertilisers were applied as per the package of practice. The crop was mainly grown under irrigation condition through the bore well. The treatment viz., T₁: Farmer's practice (Local), T₂: Arka Bheem and T₃: Bhima Kiran. Five plant samples were selected randomly from each trial. The observations on number of days on Neckfall, bulb weight, purple blotch incidence, thrips incidence, Bolting incidence, bulb yield and economics of all the varieties were recorded. Based on the net plot yield the yield calculated (q/ha). The cost of cultivation and gross returns were worked out by using present market prices of inputs during the period of experiment (Table 2 and 3). Benefit-cost ratio (BCR) was worked out by using the following formula. Benefit: Cost ratio (BCR) = Gross return (₹/ha) / Gross Cost (₹/ha)

Table 1: Characteristics of selected varieties

Variety / Special feature	TO1: Local variety	TO2:Arka Bheem	TO3: Bhima Kiran
1.Season	<i>Rabi</i>	<i>Rabi</i>	<i>Rabi</i>
2.Days to Neckfall	12-15	10- 12	10-12
3.Bulb Weight (g)	25- 28 q ha ⁻¹	28- 30 q ha ⁻¹	28- 32 q ha ⁻¹
4.Duration (days)	120-130 days	125-135 days	125-135
5.Pest and disease incidence	Susceptible to Purple blotch incidence, Thrips and Bolting	Resistance to Purple blotch incidence, Thrips and Bolting	Resistance to Purple blotch incidence, Thrips and Bolting
6.Source	Local	IIHR Bangalore	DOGR, Pune

Results and Discussion

Pest and disease incidence (%) on different onion varieties

Onion genotypes observed the lower pest and disease incidence (%) in Arka Bheema and Bhima kiran compared to farmers practice ie., Local (Table 2). Bheema Kiran recorded the lowest value of days to neckfall (11.50), purple blotch incidence (8.00 %), thrips incidence (13.50 %) and

bolting incidence (12.50 %) followed by Arka Bhim with value of days to neckfall (12.50), purple blotch incidence (8.50 %), thrips incidence (16.00 %) and bolting incidence (14.00 %) and lowest was recorded in the farmer's practice (Local) with value of days to Neckfall (15.00), purple blotch incidence (19.50 %), thrips incidence (19.00 %) and bolting incidence (16.50 %) (Table 2). Similar results were recorded by Biswanath *et al.*, 2020.

Table 2: Growth performance on onion varieties in farmer's field (Average of 5 trials)

Year	Days for Neckfall			Purple Blotch (%)			Thrips (%)			Bolting (%)		
	TO1	TO2	TO3	TO1	TO2	TO3	TO1	TO2	TO3	T1	T2	T3
2024-25	16	13	12	21	8	8	18	15	13	16	14	12
2025-26	14	12	11	18	9	8	20	17	14	17	14	13
Mean	15.00	12.50	11.50	19.50	8.50	8.00	19.00	16.00	13.50	16.50	14.00	12.50

Yield and Yield Attributes of onion varieties

The results revealed that there was a variation in yield was observed among the Onion varieties (Table 3). In addition the Onion variety Bheem Kiran recorded the highest Bulb weight and Bulb yield (125.50 and 310.35 in g and q/ha respectively) and less days to maturity (123.50 days) followed by Arka Bhim (121.00 and 292.85 in g and q/ha respectively) and less days to maturity (133.50 days) and lowest was recorded in the farmer's practice (Local) (102.00

and 281.30 in g and q/ha respectively) and more days to maturity (141.00 days). The varieties Arka bhim and Bheem kiran were tolerant to purple blotch, thrips and bolting incidence and less days to maturity. So these varieties were well suited for the local condition. Percent increase over local variety in Bheema Kiran (10.33) is superior compare to arka bhim (4.11). Similar results were recorded by Biswanath *et al.*, 2020.

Table 3. Yield performance of Onion varieties in farmer's field (Average of 5 trials)

Year	Duration (Days)			Bulb Weight (g)			Bulb Yield (q/ha)			% increase over T1		
	TO1	TO2	TO3	TO1	TO2	TO3	TO1	TO2	TO3	TO1	TO2	TO3
2024-25	140	132	124	100	122	124	279.6	294.2	312.3	0	5.22	11.69
2025-26	142	135	123	104	120	127	283	291.5	308.4	0	3	8.97
Mean	141.00	133.50	123.50	102.00	121.00	125.50	281.30	292.85	310.35	0.00	4.11	10.33

Cost economics of onion varieties

Gross and net returns were ₹ 580850 q/ha and ₹ 381350 q/ha respectively by cultivating Bheem Kiran followed by Arka Bhim (Gross and net returns were ₹ 549262 q/ha and ₹

351762 q/ha respectively) as against ₹527225 q/ha and ₹ 329725 q/ha in the farmer's variety. Benefit cost ratio of 2.91, 2.75 and 2.66 were recorded in Bheem Kiran, Arka Bhim and farmer's practice (Local) varieties respectively

(Table 4). The probable reason were lesser incidence of purple blotch incidence, bolting incidence diseases, less thrips incidence coupled with higher values of onion bulb

weight resulting in higher Onion bulb yield, these results were in agreement with the findings of Sunil kumar *et al* (2021) and Biswanath *et al* (2020).

Table 4. Economics of groundnut varieties in farmer's field (Average of 5 trials)

Year	Gross cost (Rs)			Gross Returns (Rs)			Net Returns (Rs)			B:C Ratio		
	TO1	TO2	TO3	TO1	TO2	TO3	TO1	TO2	TO3	TO1	TO2	TO3
2024-25	200000	204000	204000	559200	588400	625000	359200	388400	421000	2.79	2.88	3.06
2025-26	195000	195000	195000	495250	510125	536700	300250	315125	341700	2.53	2.61	2.75
Mean	197500	199500	199500	527225	549262	580850	329725	351762	381350	2.66	2.75	2.91

Conclusion

Onion variety, Arka Bhim and Bheem Kiran were recorded less incidence of Neckfall, purple blotch, bolting, thrips and less days to maturity, higher bulb yield, good withstand under cold and performed very well compared to farmer practice variety under irrigated condition. These two varieties were well suited for higher onion yield in the irrigation cultivation during *rabi* season in Bidar district of Karnataka.

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