Short communication

Performance evaluation of onion (*Allium cepa* L.) varieties in tropical plains of Thrissur district, Kerala

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Abstract

A screening trial to identify the suitable onion varieties for the plains of Thrissur district was carried out in Krishi Vigyan Kendra, Thrissur,India during 2014-15 with 20 high yielding varieties and the biometric and yield parameters were analyzed. Though there were not much significant differences in the performance of the varieties, the study revealed that onion can also be a good and viable option that can be grown in the homesteads in the plains of the district in the winter season. Based on the study, the onion varieties Bhima Sakthi, Agri Found Light Red, Agri Found White, Arka Kalyan, Bhima Super, and Agri Found Dark Red can be recommended for the plains of Thrissur distrct, Kerala state. The results presented based on analysis of data reflects that all varieties tried were appreciable in the field conditions except Bhima Raj in terms of marketable bulb yield and percentage of productive bulbs. Except three of the varieties tried, all can be subjected to further investigations on crop management practices to realize the potential yield.

Keywords: Bulb yield, Marketable bulb yield, Onion, Varietal screening.

Onion (*Allium cepa* L) is major vegetable consumed by Keralites throughout the year. But it is not a traditional vegetable crop grown in Kerala due to the prevailing typical humid tropical agro climatic condition. However, with the advent of tropical varieties as well as adaptation of traditional varities to climate change, the cultivation of cool season vegetables during winter season is gradually picking up in the plains of Kerala during recent years. Trials on performance evaluation of Kharif onion carried out by Krishi Vigyan Kendra,Thrissur during 2011-2012 and 2012-13 found that the variety Agri Found Dark Red could come up well in the agro ecological conditions of the plains during the winter months of October – February (Menon et al., 2014). Kharif onion technology with varieties, especially N-53, Agri Found Dark Red and Arka Kalyan were reported to have contributed significantly to area expansion, increase in production and productivity (Chadha and Chaudhary, 2007). As there is dearth of information regarding the adaptability of onion varieties to the agro climatic situation in the plains of Kerala, a need was felt for screening varieties suitable to plains of Kerala, and hence the study was undertaken to assess the performance of various high yielding varieties of onion widely cultivated in other regions of India.

The experiment was conducted during October 2014 to February 2015 at KVK farm, Thrissur, Kerala. The location lies at 10.52° N and 76.21° E and at an altitude of 2.83 m above Mean Sea Level with an average annual rainfall of 3000 mm. The soil of experimental site was sandy loam with a pH of 4.8. The monthly mean minimum temperature during the trial period was in the range of 22.1 to 23.7 and the maximum in range of 31.3 to 34.3. The mean relative humidity was 55-82%. The total rainfall

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received during the crop period was 534.6 mm with a total 34 rainy days (source; Agromet observatory, Vellanikkara, Thrissur).

The treatments consisted of twenty varieties of big onion (Fig. 1), laid out in RBD and replicated thrice. The plot size was 3 m^2. The land was ploughed thoroughly and flat beds of one meter width were formed. Dried cow dung was incorporated @ 1 kg m^{-2} as basal dose, one week after liming. Seven week old seedlings were transplanted at a spacing of 20 X 10 cm by 1st week of November. A fertilizer dose of 80: 40: 60 kg N: P_2O_5: K_2O kg ha^{-1} was applied in four split doses at 15, 30, 45 and 60 days. The entire dose of phosphatic fertilizer was applied as basal. Biometric characters like number of leaves and plant height were recorded at one month after planting and two months after planting. In addition, collar girth and bulb diameter, bulb weight per plant, percentage marketable yield per plot as well as total yield per plot were recorded after harvest. The data on number of leaves, leaf length, bulb size and collar girth were also recorded from ten randomly selected plants and averages were worked out. The data were analyzed using MSTAT-C and multiple comparisons were made using Duncan Multiple Range Test (DMRT).

Data on number of leaves are presented in Table 1. Leaf number per plant varied from 5.33 (Bhima Subra) to 7.87 (Agri Found Rose) at one MAP and 5.33 (Agri Found White) to 8.67 (Bhima Super) at two MAP. The leaf number per plant varied with varieties. Shah et al. (2012) also observed that the varietal differences among onion varieties arose due to genetic variability.

In onion, plant height is nothing but the leaf length. Plant height at two MAP was highest for the variety Bhima Super, which was at par with all other varieties except Agri Found White and Agri Found Rose. In most of the varieties, the plant height showed a slight decline from one MAP to two MAP. Shah et al. (2012) have also found that mean leaf length in onion varied significantly among varieties. According to Khan et al. (2001), the variation in

Table 1. Biometric parameters of different varieties of onion in the trial

Name of Variety	No. of leaves per plant		Plant height (cm)		Collar girth (cm)	Bulb diameter (cm)
	I*MAP	2 *MAP	I*MAP	2*MAP		
Agri Found Light Red	7.47^{ab}	6.00^{cde}	52.87^{ab}	49.67^{bc}	4.22^{def}	3.26^{abc}
Agri Found White	6.87^{abcd}	5.33^{e}	48.23^{bc}	39.47^{d}	4.27^{def}	3.55^{a}
Agri Found Rose	7.87^{a}	5.93^{de}	43.40^{c}	36.73^{d}	3.52^{f}	3.39^{ab}
Bhima Sakthi	6.13^{cde}	6.13^{cde}	59.20^{a}	56.07^{abc}	5.27^{abc}	3.15^{abc}
Arka Kalyan	7.07^{abc}	7.13^{abcd}	54.47^{ab}	53.13^{abc}	4.75^{bcd}	2.83^{abcd}
Arka Nikethan	6.20^{cde}	6.40^{bcde}	49.87^{bc}	48.17^{c}	3.79^{ef}	2.78^{abcd}
Bhima Raj	6.13^{cde}	7.67^{abc}	51.73^{abc}	54.60^{abc}	6.02^{a}	2.73^{bcd}
N-2-4-1	5.93^{cde}	6.20^{cde}	51.07^{abc}	50.67^{abc}	5.35^{abc}	3.18^{abc}
Bhima Super	6.40^{bcde}	8.67^{a}	55.93^{ab}	57.60^{a}	5.53^{abc}	3.08^{abc}
NHRDF Red 2	6.53^{bcde}	6.27^{cde}	50.07^{bc}	49.53^{bc}	4.63^{cde}	3.23^{abc}
Bhima Red	5.80^{cde}	8.27^{a}	56.33^{ab}	57.00^{ab}	5.29^{abc}	2.19^{d}
Bhima Kiran	6.07^{cde}	6.27^{cde}	52.93^{ab}	54.40^{abc}	5.06^{bcd}	2.68^{bcd}
Bhima Swetha	6.40^{bcde}	8.00^{ab}	51.87^{abc}	57.00^{abc}	5.45^{abc}	2.70^{bcd}
Arka Pragathi	6.13^{cde}	7.27^{abcd}	54.33^{ab}	53.40^{abc}	4.68^{cd}	2.50^{cd}
Bhima Subra	5.33^{e}	7.67^{abc}	50.07^{bc}	55.40^{abc}	5.64^{ab}	2.87^{abcd}
Rosy	6.26^{bcde}	7.47^{abcd}	50.40^{abc}	52.33^{abc}	4.93^{bcd}	3.21^{abc}
Lalima	5.67^{de}	7.47^{abcd}	49.53^{bc}	53.73^{abc}	4.34^{def}	3.05^{abc}
Agri Found Dark Red	6.00^{cde}	7.47^{abcd}	48.00^{bc}	51.80^{abc}	4.73^{bcd}	3.28^{abc}
NHRDF Red 1	6.07^{cde}	7.33^{abcd}	48.00^{bc}	51.60^{abc}	5.32^{abc}	2.87^{abcd}
NHRDF Red 3	5.67^{d}	7.07^{abcd}	52.20^{abc}	54.93^{abc}	4.80^{bcd}	2.86^{abcd}

Note : *MAP- Months After Planting

Figures with even alphabets as superscript are on par at $P > 0.05$.

Table 2. Yield parameters of different varieties of onion in the plains of Thrissur district

Name of varieties	Bulb weight plant^{-1} (g)	Total bulb yield (kg 3m^{-2})	Percentage of productive bulbs	Marketable bulb yield(kg 3m^{-2})	Marketable yield (Mg ha^{-1})
Agri Found Light Red	74.33^{abc}	6.14^{a}	63.27^{ab}	4.63^{ab}	15.43^{ab}
Agri Found White	67.00^{abc}	5.06^{ab}	70.78^{a}	4.19^{ab}	13.97^{ab}
Agrifound Rose	33.83^{d}	2.66^{c}	35.99^{c}	1.06^{d}	3.53^{d}
Bhima Sakthi	68.50^{abc}	6.27^{a}	63.36^{ab}	4.85^{a}	16.15^{a}
Arka Kalyan	60.17^{c}	5.13^{ab}	60.16^{ab}	3.91^{ab}	13.02^{ab}
Arka Nikethan	70.17^{abc}	4.25^{bc}	50.01^{bc}	3.26^{abc}	10.86^{abc}
Bhima Raj	65.17^{abc}	3.46^{bc}	37.26^{c}	2.04^{cd}	6.79^{cd}
N-2-4-1	76.50^{abc}	4.48^{ab}	65.76^{ab}	3.75^{ab}	12.49^{ab}
Bhima Super	79.67^{ab}	5.21^{ab}	59.83^{ab}	4.10^{ab}	13.65^{ab}
NHRDF Red 2	74.17^{abc}	5.06^{ab}	68.23^{ab}	4.19^{ab}	13.95^{ab}
Bhima Red	62.17^{bc}	4.53^{ab}	62.18^{ab}	3.72^{ab}	12.39^{ab}
Bhima Kiran	70.00^{abc}	4.86^{ab}	61.29^{ab}	3.86^{ab}	12.85^{ab}
Bhima Swetha	81.33^{ab}	4.04^{bc}	69.96^{a}	3.52^{abc}	11.72^{abc}
Arka Pragathi	73.17^{abc}	4.90^{ab}	74.90^{a}	4.32^{ab}	14.39^{ab}
Bhima Subra	81.83^{a}	4.66^{ab}	64.81^{ab}	3.92^{ab}	13.05^{ab}
Rosy	76.00^{abc}	4.61^{ab}	70.77^{a}	3.98^{ab}	13.25^{ab}
Lalima	75.50^{abc}	4.88^{ab}	73.15^{a}	4.38^{ab}	14.59^{ab}
Agri Found Dark Red	72.50^{abc}	4.10^{bc}	67.38^{ab}	3.37^{abc}	11.22^{abc}
NHRDF Red 1	72.67^{abc}	3.75^{bc}	63.55^{ab}	3.08^{bc}	10.25^{bc}
NHRDF Red 3	75.33^{abc}	4.85^{ab}	67.94^{ab}	3.75^{ab}	12.49^{ab}

Note: Figures with even alphabets as superscript are on par at P >0.05.

plant height among different varieties is due to difference in adaptability of these cultivars to a particular environment.

Table 2 indicates that the highest collar girth of 6.02 cm was for Bhima Raj and the lowest in Agri Found Rose (3.52 cm). Collar girth in onion is an important character because it indicates the bulb storage ability. However, Gautam et al. (2006) reported that onion varieties did not differ significantly in this parameter. In the case of bulb diameter, the values observed were in a narrow range of 2.19 cm (Bhima Red) to 3.55 cm (Agri Found White).

The average fresh bulb weight was highest in Bhima Subra which was on par with all other varieties except Agri Found Rose. Gautam et al. (2006) also reported that onion varieties differed significantly with respect to fresh bulb yield.

Percentage of productive bulbs is an important yield attribute of onion as far as adaptability is concerned. Except for varieties Bhima Raj (37.26%) and Agri found Rose (36%), all other eighteen varieties were at par in production of marketable bulbs .A wide variation from 36% to 75.5% was observed in this parameter, which indicated the difference in varietal performance. However, varieties which recorded the highest values are Arka Pragathi (74.90%), Rosy (70.77%), Bhima Swetha (69.96%) and Agri Found White (70.78%). The variation indicates that the bulb weight can vary depending on the factors influencing plant growth and yield and can be improved through crop management practices.

Fresh marketable bulb yield per plot was the highest in variety Bhima Sakthi (4.85 kg), which was on par with all other varieties except Agri Found Rose (1.06 kg), Bhima Raj (2.03) and NHRDF Red 1 (3.08). Agri Found Rose is a nationally released variety characterized by its small sized bulbs highly suited for salad purpose (Guptha and Singh, 2010). It can be inferred that except varieties Bhima Raj and NHRDF Red 1, all other varieties may be recommended for cultivation in the plains of Thrissur District which recorded yield in the range of 11.22 to 16.15 Mg ha^{-1}.

Figure 1. Harvested bulbs of selected onion varieties

A significant difference between varieties in marketable bulb yield was reported by Gautam et al. (2006). Mahenthesh et al. (2009) found that Arka Kalyan and Agri Found Light Red are high yielding varieties suitable to central zone of Karnataka and the bulb weight was 53.16 g and 60.66 g respectively. However, in the present trial both Arka Kalyan and Agri Found Light Red varieties recorded higher bulb weight of 60.17 g and 74.33 g respectively, which indicates the adaptability of these varieties. Significant differences in bulb yield, size of bulb and plant height in big onion was also reported by Dev (2009).

The performance assessment of twenty different onion varieties shows that most of the varieties can come up well in the plains of Kerala during winter season. However, some of the varieties tried in the experiment failed to record the optimal yield probably due to the fact that in Kerala the winter season is short and the long duration varieties like Arka Nikethan (145 days) and Bhima Raj (120–125 days) reached the senescence phase by about 100-110 days. They also recorded lower values for percent productive bulbs (50.01% and 37.26% respectively).

The study indicates the possibility of inclusion of onion as a cool season crop in homestead farming in plains of Kerala. The results presented are based on analysis of data reflects that all varieties tried were appreciable in the field conditions except Bhima Raj in terms of marketable bulb yield and percentage of productive bulbs. Based on the study, the onion varieties Bhima Sakthi, Agri Found Light Red, Agri Found White, Arka Kalyan, Bhima Super, and Agri Found Dark Red can be recommended for the plains of Thrissur district, Kerala state. Realization of full potential of yield might be possible by improved crop management practices for which further trials are to be streamlined.

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