



Assessment of Improved Variety of Tuberose (*Polianthes tuberosa*) Prajwal for Yield and Economics in Western Parts of Chittoor District of Andhra Pradesh

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ABSTRACT

The present study was conducted during 2015-2018 for three years to assess the performance of high yielding tuberose variety Prajwal for western parts of Chittoor district of Andhra Pradesh. The improved variety Prajwal was plated along with local variety Hyderabad single as check in 0.2ha each in the fields of five farmers at Ayyavaripalli and Chinnagangulavaripalli villages during June 2015 and continued for three years. The results revealed that among the two varieties Prajwal recorded significantly higher number of spikes per plant (2.86 no./plant), number of flowers per spike (46.9 no./spike), flowering duration of spike (16.55d), spike length (105.88cm), flower weight per spike (55.31g), 100 flower weight (91.80g), flower yield per plant (165g) and flower yield per hectare (17.7t/ha). The economic parameters *viz.*, benefit cost ratio (2.22), marginal benefit cost ratio (26.5) and relative economic efficiency (12.92) were recorded more in Prajwal than Hyderabad single. The Prajwal variety showed superiority over Hyderabad single and found suitable for western parts of Chittoor district of Andhra Pradesh.

Key Words: Efficiency, Flower, Hyderabad Single, Prajwal, Spikes, Tuberose, Yield.

INTRODUCTION

In India, commercial cultivation of tuberose is popular in states of West Bengal, Tamil Nadu, Maharashtra, Andhra Pradesh, Karnataka, Assam, Gujarat and parts of Punjab and Uttar Pradesh. In Andhra Pradesh, East Godavari, Guntur, Chittoor, Krishna are the leading districts taking up tuberose cultivation (Jadav and Gurav, 2018). Tuberose (*Polianthes tuberosa*) belongs to family Agavaceae is a bulbous fragrant ornamental plant grown in the tropical and subtropical areas for cut flower and fragrance (Manas *et al*, 2018). Among ornamental bulbous plants valued for their beauty and fragrance of the flowers, the tuberose occupies a very special and selective place (Sood and Nagar, 2005). In India, Tuberose is a very popular flower and millions of spikes are sold every year. Tuberose flowers are cultivated to produce flower spikes

and loose flowers on a commercial scale for the domestic market.

Tuberose flowers are cultivated throughout the year and can be grown outdoor or under greenhouse conditions. Single type is predominantly cultivated and used in garland making, social functions and in perfumery industry for extraction of essential oil. Mostly local varieties are cultivated by the farmers of Chittoor district. Productivity was lesser due to low yielding local varieties. Many hybrids have been introduced in Tuberose by Indian Institute of Horticultural Research (IIHR), Bengaluru, National Botanical Research Institute (NBRI), Lucknow and various other Agricultural Institutes.

Tuberose is one of the important flower crop cultivated in Chittoor district as loose flower for purpose of making garland and veni. It is being used

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Table 1. Characters of different tuberose varieties.

S. No.	Variety	Character
1.	Shringar	This variety of tuberose develop through hybridization, cross between ‘Single x Double’ and was released by Indian Institute of Horticultural Research (IIHR), Bangalore. Flower is highly fragrance and medium spikes. Flower bud attractive due to pinkish tinge. Spike has more number of flowers and florets are large in size. These type flowers basically use loose flower purpose and yield of these flower are 15,000-20,000 kg/ha.
2.	Vaibhav	Semi-double flowers on medium spike, cross Mexican Single x IIHR2, developed by IIHR
3.	Prajwal	Prajwal Tuberose variety was released by Indian Institute of Horticulture research, Bengaluru during the year 2014. Prajwal is a Hybrid of Shringar x Mexican single. This hybrid bears single type white flowers on long stiff spikes (95 cm, 50 florets per spike). The individual flowers are larger in size compared to local single. Prajwal yields 15.5 – 18 t/ha/year which is 20 per cent more loose flowers than “Shringar”. The loose flowers yield is high compared to other varieties of Tuberose.
4.	Suvasini	It is double type flower with multi whorled variety and release from Indian Institute of Horticulture Research (IIHR), Bangalore. It is developed by hybridization, cross between ‘Single’ and ‘Double’. These varieties produce more number of flowers per spike, bold flowers and uniformity flowers develop. Suvasini flower are white colour with fragrance. In this flower mainly use for cut flower purpose. Spike yield is higher 25per cent than Pearl Double cultivar.
5.	Mexican White Double	Creamy flower with three row of corolla segments
6.	Kalyani Single	Long single flowers, petals with creamy colour
7.	Arka Nirantara	Single-flower type ,Single rows of petals, Flower Spike curvature Present
8.	Hyderabad Double	More than three rows of corolla segment
9.	Mexican Single	Florets bearing single segment of corolla
10.	Swarna Rekha	It is developed through induce mutation (gamma ray) and release from National Botanical Research Institute (NBRI), Lucknow. The flowers are double with golden yellow steaks along the margins of leaf. Concrete content has been found to be 0.062 per cent.
11.	Phule Rajani	Single rows of corolla segment
12.	Pearl Double	Flowers are pure white with more than three segments of corolla
13.	Hyderabad Single	Hyderabad Single Tuberose variety was released by Andhra Pradesh Agricultural University (APAU). Hyderabad Single is a popular local variety grown by tuberose farmers in Chittoor district of Andhra Pradesh. Hyderabad Single tuberose variety bears pure white flowers with one row/ whorl of corolla segment. Flowers are highly scented Each spike produces 30 flowers It has profuse flowering habit and suitable for cultivation in marginal soils also.
14.	Arka Sugandha	Small size spike with more number of single florets
15.	Rajat Rekha	In this variety develop through induce mutation (gamma ray). It is a single flowered variety released by National Botanical Research Institute (NBRI), Lucknow. Flowers are silvery white streaks along the middle of the leaf blade. Concrete content 0.089 per cent.

Assessment of Improved Variety of Tuberose

Table 2. Performance of Tuberose varieties at farmer's field during 2015 to 2018.

Sr. No.	Parameter	Prajwal				Hyderabad Single			
		2015-16	2016-17	2017-18	Mean	2015-16	2016-17	2017-18	Mean
1.	No. of Spikes/plant	2.83	2.94	2.75	2.86	1.83	1.75	1.66	1.75
2.	No. of flowers/spike	44	49.3	47.5	46.9	34.1	40.3	39.1	37.8
3.	Flowering duration of spike (days)	16.83	15.66	17.16	16.55	9.16	9.33	9.66	9.38
4.	Spike length (cm)	105.83	106.16	105.66	105.88	83.16	87.66	80.66	83.83
5.	Flower weight per spike (g)	56.34	55.10	54.51	55.31	41.96	37.00	42.4	40.47
6.	100 flower weight (g)	91.87	91.5	92.05	91.80	71.75	77.08	77.66	75.50
7.	Yield/plant (g)	165	178	152	165	60	62	52	57
8.	Yield (t/ha)	17.4	18.6	17.2	17.7	7.7	7.5	7.2	7.4

for worshipping, offerings in religious functions and auspicious days. The performance of tuberose cultivars varies with climate. The Chittoor district normal temperature during South west monsoon (June-September) *Kharif* is 36°C, during north east monsoon (October-December) *Rabi* is 34°C, during winter is 32°C and 38°C during summer. The existing local cultivars are low yielding and give low margin to the farmers. Hence, experiment was conducted to assess suitable high yielding variety 'Prajwal' for commercial cultivation in this district.

MATERIALS AND METHODS

The experiment been conducted at farmer's field for three years during 2015-18 at five farmer's field in Ayyavaripalli and Chinnagangulavaripalli villages of Chittoor district. Two varieties were used and Prajwal tuberose bulbs were supplied to the farmers under treatment T1 was Prajwal whereas T2 was local variety. The improved Prajwal variety

has been compared with local variety *i.e* Hyderabad Single and the characters of tuberose varieties were given in table 1. Each experimental plot size was 0.2 ha and the planting was taken up during June 2015 at five farmer's fields. The observations *viz.*, number of spikes per plant, number of flowers per spike, flowering duration of spike (days), spike length (cm), flower weight per spike (g), 100 flower weight (g), flower yield per plant (g) and flower yield per hectare (t/ha) and economic character like cost of cultivation, gross income, net income, marginal benefit cost ratio (MBCR), relative economic efficiency (REE), benefit to cost ratio (BCR) were recorded.

The soil type was sandy loam, pH 6.4, and EC was 0.8. The available nitrogen, phosphorus, potassium content were 142, 12, 210 kg/ha respectively. The tuberose bulbs were planted in double row system with spacing of 120 x 20 x 10 cm. Drip emitters were installed for providing

Table 3. Comparison of means of the yield characters with check variety for three years.

Sr.No.	Parameter	Prajwal	Hyderabad Single	Percent increase
1.	No. of florets/spike	46.9	37.8	24.07
2.	No. of Spikes/plant	2.86	1.75	63.4
3.	Yield/plant (kg)	0.165	0.057	189.47
4.	Yield (t/ha)	17.7	7.2	139.18
5.	Average cost per kg (Rs)	45	37	21.62

Table 4. Pooled analysis of Repeated Measure Mixed ANOVA for Tuberose flower yield

Year	Variety	Mean Yield (t/ha)	Stranded Deviation	t-value	p-value
2015-16	Prajwal	17.4	0.78	19.87**	0.000
	Hyderabad Single	7.7	0.91		
2016-17	Prajwal	18.6	0.84	28.83**	0.000
	Hyderabad Single	7.5	0.45		
2017-18	Prajwal	17.2	0.77	25.72**	0.000
	Hyderabad Single	7.2	0.53		
Mean	Prajwal	17.73	0.79	24.80**	0.000
	Hyderabad Single	7.42	0.63		

** Significant at 1% level

irrigation. Before planting of the tuberose bulbs were treated with copper oxy chloride (3g/l). Farm yard manure (10 t/ha), recommended dose of fertilizers NPK– 200:200:200 kg/ha, neem cake 250 kg/ha has been applied as a basal dose. The flowers, spikes and yield data obtained were statistically analysed with SPSS and repeated measures mixed ANOVA is carried out for pooled analysis of three years data with two treatments. The Benefit Cost ratio (B:C), Marginal Benefit Cost Ratio (MBCR) and Relative Economic Efficiency (REE) (Sarma, 2018) were calculated by using following formula as given below.

RESULTS ANS DISCUSSION

From the results (Table 2), it was evident that the improved variety Prajwal showed the highest number of spikes per plant (2.86 no./plant), number

of flowers per spike (46.9 no./spike), flowering duration of spike (16.55d), spike length (105.88cm), flower weight per spike (55.31g), 100 flower weight (91.80g) compared to Hyderabad single. In Prajwal flower yield per plant (165g) and flower yield per hectare (17.7t/ha) were more compared to Hyderabad single and this might be due to more number of flower per spike and more flower weight per plant which also reflected in higher 100 flower weight (91.80g). Similar results were reported by Krishnamoorthy (2014), Ranchana *et al* (2013), Gurav *et al* (2005) in tuberose.

The improved variety Prajwal was well adaptive to different region of the district and there was a significant increase in the yield of the Prajwal compared to that of the local variety *i.e.* Hyderabad single (Table 3). The flower yield per plant (165 g) was significantly higher in Prajwal than the local

$$B:C \text{ ratio} = \frac{\text{Net return}}{\text{Cost of cultivation}}$$

$$\text{Marginal Benefit Cost Ratio (MBCR)} = \frac{\text{Gross return of new variety} - \text{Gross return of farmer's variety}}{\text{Total variable cost of new variety} - \text{Total variable cost of farmer's variety}}$$

$$\text{Relative Economic Efficiency (REE)} = \frac{\text{Net return of new variety} - \text{Net return of farmer's variety}}{\text{Net return of farmer's variety}}$$

Assessment of Improved Variety of Tuberose

variety as indicated by the more number of flowers per spike (46.9). In Table 4 data has shown that, in general for garland making individual higher weight flowers not preferred by the merchants. Even though Prajwal flowers fetch higher price per kilogram compared to the local varieties because of its quality *i.e.* fragrance and appearance. Though there is daily price fluctuation, it fetched an average of Rs. 45/kg which was 21.62 per cent higher than the average market price of the flowers of local variety. Prajwal also used for concrete extraction and it fetched more price per kilogram as compared to local varieties which resulted in higher net returns to the farmers.

The data about interaction effect of year and variety were found non significant which indicated that during three years both varieties performed in the same way. Further, Prajwal performed well with higher flower yield of 17.73 t/ha than check variety *i.e.* Hyderabad single 7.42 t/ha. Hence improved tuberose variety Prajwal was most suitable for cultivation. Similar results were reported by Singh *et al* (2018).

Table 5. Interaction of varieties over three years

Source	F-Value	P-value
Year	0.774	0.400
Year * Variety	0.035	0.856
Variety	1400**	0.000

** Significant at 1% level

In table 6 economic impact of Prajwal tuberose variety over Hyderabad single variety was calculated and results revealed that by cultivating

Table 6. Economic Impact of Tuberose variety Prajwal.

Tuberose variety	Cost of Cultivation (Rs/ha)	Gross Returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio	Marginal Benefit Cost Ratio (MBCR)	Relative Economic Efficiency (REE)
T1: Prajwal	246940	796500	549560	2.22	26.5	12.92
T2: Hyderabad Single	226940	266400	39460	0.17		

Prajwal tuberose variety farmers got more benefit cost ratio (2.22) over Hyderabad single (0.17). This may be due to higher yield obtained with Prajwal tuberose variety compared to farmer's practice. Similar results were obtained by Mahawer *et al* (2013). Suitability of new variety was assessed with marginal benefit cost ratio (26.5) and economic efficiency was assessed with Relative Economic Efficiency (12.92). The cultivation of Prajwal tuberose variety gave higher net return Rs.5, 49,560/- over three years as compared to Hyderabad single.

CONCLUSION

Tuberose improved variety Prajwal with more number of spikes per plant, more flowers per spike and more flower weight per plant gave higher yield and B: C ratio. Hence, the farmers were satisfied with the tuberose variety Prajwal cultivation. Hence, it was concluded that tuberose variety Prajwal was most suitable variety for Chittoor district of Andhra Pradesh. At present, the area under Prajwal in Chittoor district is nearly 80 per cent of the total area under tuberose.

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