Effect of Nitrogen, Phosphorus and Spacing on growth and flowering characters of Tuberose under Eastern Part of Uttar Pradesh conditions

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Abstract:

In this study, we examined how tuberose's development and blooming characteristics under the environmental circumstances of the Eastern Part of Uttar Pradesh were affected by nitrogen, phosphorus, and spacing.

Keywords: Nitrogen, Phosphorus, Spacing, growth and flowering, Tuberose

Introduction:

Tuberose (*Polianthus tuberose* L.) belongs to family Amaryllidaceae and genus has about 14 species. Its origin place is Mexico. Among the bulbous blooms, it is the most significant production for commercial cut flowers. Due to its better yield, beautiful scent, longer vase life of the spikes, and broad climatic and soil adaptation, it is particularly well-liked among farmers. They use its flower to produce gajras, bouquets, garlands, and to extract essential oils. The Iran country is famous for best quality of tuberose flowers throughout the world because for aroma and best quality of flowers with quantity too; which is highly in demand in all worlds. Despite the fact that nutritional concerns are crucial for enhancing the quality and quantitative characteristics, marketability, and exports of this flower, they have not received much attention in the eastern Uttar Pradesh area.

In order to develop a canopy, nitrogen fertiliser is essential since a lack of it causes the photosynthetic process to be slowed down (Thoma et al., 1975). Additionally, phosphorus and nitrogen are crucial components for development (Banker et al., 1980). Potassium, however, has no impact on it (Kishore et al., 2006). The flower grew and produced to its full potential when given 120:60:30 kg/ha of N:P:K, according to Gopal Krishnan et al. (1995).

According to Al-Badawy et al. (1995), the application of nitrogen increased the amount of carotenoids in flowers, chlorophyll a and b in leaves, and nitrogen percentage in shoots. According to observations made on tuberose by Khalaj and Edrisi (2007), nitrogen injection had no appreciable impact on the vase-life of tuberose cv (Polianthes tuberosa L.). Due to the paucity of research on this topic in eastern Uttar Pradesh, the current study, "Effect of nitrogen, phosphorus, and spacing on growth, flowering, yield of tubers, and physiochemical

characteristics in tuberose (Polianthes tuberosa L.) cv. Single," was carried out at the farm of S.D.J.P.G. College in Chandeshwer-Azamgarh, Uttar Pradesh, in 2019–20.

Materials and Methods

The study was carried out in the academic year 2019–20 (Kharif season, May to September month) at the farm of S.D.J.P.G. college at Chandeshwer, Azamgarh, Uttar Pradesh. The college situated 05 km away from Azamgarh city in Eastern Uttar Pradesh. The soil of the field had pH of was 7.8 (measured by Beckman's glass electrode method), EC = 0.52 mmhos/cm, Organic carbon = 0.40% (low), available nitrogen = 365 kg/ha (medium), available phosphorus = 12 kg/ha (low) and available potassium = 194 kg/ha (medium).

The experiment was conducted using simple randomized block design with 3 treatments (Nitrogen: 4 levels: N1 = 100 kg/ha, N2 = 200 kg/ha, N3 = 300 kg/ha, N4 = 400 kg/ha, Phosphorus: 3 levels: P1 = 100 kg/ha, P2 = 150 kg/ha, P3 = 200 kg/ha and spacing: 3 levels: S1 = 30 x 20 cm, S2 = 30 x 30 cm, S3 = 30 x 40 cm) & 3 repetitions. The well rotten Farm Yard Manure was applied during last ploughing @ 5 kg/m^2. The fertilizers were applied before planting in form of Urea and Di-ammonium Phosphate as per treatment. The Variety- Hyderabad Double was used in research.

Result and Discussion

Table -1: Growth Parameters

Treatments	Plant height (cm) 60 DAP	Number of leaves /plant 60 DAP	Length of leaves (cm) 60 DAP	Width of leaves (cm) 60 DAP	Fresh weight of leave/plant	Dry weight of leaves /plant
S1N1P1	35.20	21.01	50.55	1.40	192.00	15.94
S1N2P1	36.17	22.09	51.65	1.48	289.00	15.21
S1N3P1	36.17	21.66	51.25	1.42	291.00	15.63
S1N4P1	36.57	21.65	51.20	1.43	287.00	15.54
S1N1P2	35.67	21.18	50.75	1.57	239.00	18.11
S1N2P2	35.74	22.41	52.00	1.79	251.00	20.24
S1N3P2	36.97	22.96	52.55	2.35	252.00	21.31
S1N4P2	37.52	22.83	52.45	2.17	254.00	19.78
S1N1P3	37.39	23.35	52.95	1.74	257.00	20.11
S1N2P3	37.91	22.86	52.47	2.25	251.00	21.31
S1N3P3	37.42	23.27	52.85	1.67	254.00	22.11

S1N4P3	37.83	24.01	53.60	2.37	256.00	21.61
S2N1P1	38.57	24.10	53.65	2.47	258.00	20.41
S2N2P1	38.57	24.39	53.95	1.77	259.00	22.56
S2N3P1	38.95	25.76	55.30	2.12	260.00	24.19
S2N4P1	40.29	25.34	54.91	2.19	257.62	22.35
S2N1P2	40.36	25.77	55.35	1.71	257.65	27.00
S2N2P2	43.77	27.25	60.47	2.10	297.33	29.50
S2N3P2	42.27	26.99	60.17	1.84	285.33	28.24
S2N4P2	41.27	26.31	61.45	1.15	282.33	27.55
S2N1P3	38.29	25.32	62.42	1.20	275.67	27.57
S2N2P3	38.93	27.03	60.22	1.88	272.67	28.28
S2N3P3	40.56	26.83	60.02	1.68	274.67	28.08
S2N4P3	39.30	25.50	58.72	1.34	270.67	27.74
S3N1P1	39.17	25.76	58.97	1.61	260.00	28.02
S3N2P1	40.78	25.50	58.72	1.35	263.00	28.15
S3N3P1	40.53	25.90	59.17	1.75	265.00	27.78
S3N4P1	40.95	26.32	59.52	1.17	264.00	27.70
S3N1P2	41.36	27.05	58.47	1.90	267.00	22.31
S3N2P2	42.06	27.75	60.97	2.60	268.00	23.29
S3N3P2	42.73	24.51	56.98	1.93	270.00	24.51
S3N4P2	41.30	23.46	55.90	1.31	265.00	22.01
S3N1P3	40.27	24.01	56.48	1.43	262.70	22.71
S3N2P3	40.83	24.25	56.72	1.67	263.50	22.95
S3N3P3	41.04	23.79	56.23	1.23	266.00	22.79
S3N4P3	40.59	22.36	54.88	1.08	263.83	22.36
SE(m)	0.85	0.52	0.79	0.08	4.26	0.82
C.D.	2.39	1.47	2.24	0.23	12.42	2.31
C.V.	3.73	3.68	2.45	8.29	2.80	6.09

The results are shown in table no-1 & 2, showed that all the growth and flowering characters were significantly influenced by effect of nitrogen, phosphorus and spacing. In vegetative parameters (Table-1) among all treatments, treatment S2N2P2 (wider spacing- 30 x 30 cm, 200 kg/ha, 150 kg/ha) resulted maximum plant height (43.77 cm) followed by S3N3P2 (42.73 cm) while minimum (35.20 cm) in S1N1P1, maximum number of leaves/plant (27.25) recorded with treatment S2N2P2 followed by S3N3P2 (24.51) while minimum (21.18) in S1N1P2, maximum length of leaves (60.97 cm) recorded with S3N2P2

(30 x 40 cm, 200 kg/ha, 150 kg/ha) followed by S2N2P2 (60.47 cm) And minimum (50.55 cm) in S1N1P1, maximum width of length (2.60 cm) reported with S3N2P2 followed by S2N1P1 (2.47 cm) while minimum (1.08 cm) in S3N4P3 (30 x 40 cm, 400 kg/ha, 200 kg/ha), maximum fresh weight of leaves/plant (297.33 gm) recorded in S2N2P2 followed by S1N4P1 (287 gm/plant) while the minimum value (192 gm/plant) in S1N1P1, maximum dry weight of leaves/plant (29.50 gm) reported with S2N2P2 followed by S2N2P3 (28.28 gm) while minimum (15.21 gm) recorded with S1N1P1. According to Desai and Mamatha (2016), in the Tumkur district of Karnataka state-India, the best plant height of tuberose (variety: Prajwal) was obtained with a 30 30 cm spacing, while the lowest plant height was obtained with a 30 15 cm spacing. The plant height of tuberose is mostly influenced by nitrogen levels (variety: Pune single). Higher nitrogen dosages cause the plants to grow taller, resulting in the highest amount of plant growth. Similar results have been found by Bharathi et al. (2016), who discovered that increasing the NPK dosage up to 250:310:200 NPK/ha has a favourable impact on plant development. These results are consistent with those of Desai & Mamatha (2016), who found that a spacing of 30 30 cm works best for a plant to have a maximum number of leaves. The wider spacing with optimum nitrogen & phosphorus can provide the optimum space and solar radiation which ultimately resulted in big size of leaves. Thus the combination of wider spacing & optimum level of N and P resulted into more leaf/plant. This finding also supported by Ambad *et al* (2017) in tuberose. The big size and maximum number of leaves ultimately produced the maximum fresh & dry weight of leaves/plant.

Table No-2 : Flowering character

Treatments	Days to spike emergence	Days to flowering	Days to opening 1st pair of flowers	Spike length (cm)	Florets/spike	Duration of flowering	Yield of flowers/spike
S1N1P1	112.09	124.18	15.88	75.87	27.22	21.00	22.10
S1N2P1	113.59	125.22	16.58	76.41	27.68	19.08	22.18
S1N3P1	114.79	125.68	17.08	75.48	27.61	19.50	23.29
S1N4P1	115.09	126.10	17.28	75.16	27.67	19.96	21.61
S1N1P2	116.09	127.18	18.58	75.12	28.97	18.00	21.23
S1N2P2	114.59	126.28	17.58	75.79	30.64	17.10	22.68

S1N3P2	114.09	126.78	17.33	75.94	30.33	18.40	27.76
S1N4P2	113.59	127.34	17.83	75.48	30.82	18.16	26.76
S1N1P3	111.59	123.18	18.39	74.54	30.55	19.59	27.76
S1N2P3	113.09	124.03	17.86	75.21	29.87	20.50	28.26
S1N3P3	114.09	124.68	17.76	75.36	30.21	21.15	26.49
S1N4P3	114.94	125.59	18.51	74.90	29.19	21.25	26.00
S2N1P1	110.55	123.68	17.27	86.60	34.18	23.29	42.57
S2N2P1	111.55	122.53	16.27	88.10	34.68	23.23	42.67
S2N3P1	112.55	123.48	17.12	87.23	34.63	25.00	43.67
S2N4P1	114.05	124.45	17.99	87.15	34.36	25.90	42.92
S2N1P2	110.43	119.68	16.22	87.80	34.98	30.99	41.31
S2N2P2	109.77	118.68	15.27	89.30	35.66	32.00	42.26
S2N3P2	110.65	119.69	16.35	88.43	34.79	30.99	40.65
S2N4P2	111.77	119.67	17.42	88.35	34.71	32.98	39.90
S2N1P3	110.57	120.83	16.03	87.24	33.60	28.84	39.70
S2N2P3	110.69	121.77	16.53	88.92	35.28	28.91	40.90
S2N3P3	112.27	122.62	17.18	87.98	34.21	29.05	39.29
S2N4P3	112.77	124.26	18.18	87.85	34.21	30.41	38.95
S3N1P1	110.22	120.68	17.24	82.77	34.13	28.08	35.86
S3N2P1	110.40	121.73	16.63	83.77	34.31	29.23	36.94
S3N3P1	111.40	123.23	17.63	82.77	34.12	30.88	38.97
S3N4P1	112.70	125.01	18.13	82.27	33.63	31.85	37.31
S3N1P2	113.42	121.27	17.11	84.04	31.10	26.08	34.91
S3N2P2	113.76	122.17	16.79	84.53	31.59	26.18	35.33
S3N3P2	112.22	123.27	16.77	85.27	32.36	27.67	36.94
S3N4P2	113.72	124.45	17.35	83.91	31.00	28.85	35.99
S3N1P3	110.22	120.27	17.65	82.91	30.00	24.90	33.28
S3N2P3	110.42	121.33	16.69	83.66	30.75	24.18	33.72
S3N3P3	111.20	121.57	17.69	84.32	31.41	25.97	35.14
S3N4P3	112.22	122.45	18.23	83.24	30.33	26.69	34.19
SE(m)	0.72	0.85	0.44	0.66	0.70	0.15	0.65
C.D.	2.03	2.39	1.24	1.87	1.97	0.42	1.85
C.V.	1.11	1.19	4.40	1.39	3.95	11.77	4.61

The results from table no -2 shows that flowering traits were significantly influenced by combination of spacing, different doses of nitrogen, phosphorus positively. The minimum days for spike emergence (109.77 days) reported in S2N2P2 (30 x 30 cm, 200 kg/ha, 150 kg/ha) followed by S3N1P1 (110.22 days) while in S1N1P2 (30 $\times$ 20 cm, 100 kg/ha, 150

kg/ha) took maximum days (116.09 days) ,minimum days to flowering (118.68 days) reported in S2N2P2 followed by S2N1P2 (119.68 days) while maximum (127.34 days) in S1N1P2, minimum days (15.27 days) for opening of 1st pair florets in S2N2P2 followed by S1N2P1 (16.28) while maximum days (18.58 days) recorded in S1N1P2, maximum length of spike (89.30 cm) reported with S_3 N_4 P_1 (30 x 40cm, 400 kg/ha, 100 kg/ha) followed by S_3 N_1 P_2 (88.92 cm) while minimum (74.54 cm) reported in S_3 N_3 P_2, maximum number of florets/spike (35.66) recorded in S_3 N_4 P_1 followed by S_3 N_1 P_1 (33.63) while minimum (28.97) reported by S_1 N_2 P_3, maximum duration of flowering (32.98 days) in S_3 N_2 P_3 followed by S_3 N_4 P_1 (32 days) while S_1 N_2 P_3 reported the poorest (18 days), maximum florets/spike (43.67) produced in S_3 N_3 P_1 followed by S_2 N_3 P_1 (40.65) while the minimum (21.23) was produced by S_1 N_2 P_3. Dense planting took maximum days for spike emergence while little wider spacing recorded minimum days. The similar finding also reported by Aklande (2016) who reported that significantly to small days for spike emergence obtained in wider spacing in tuberose. The Nitrogen accelerates the cell division which ultimately resulting into fast vegetative growth of the plant; consequently early reproductive phase/ induction of early flowering happened. This finding is corroborated by Rajwal and Singh (2006), who examined the impact of different N rates (100, 125, and 150 kg/ha) on the performance of Tuberose (double variety) in Muzzaffarnagar, Uttar Pradesh, India, during 2002 and 2003. Maximum spike length at medium spacing, according to Kumar et al. (2016), was 81.56 cm (30 x 40 cm). The maximum spike length was produced at the optimum nitrogen level, which is closely related to the findings of Dhakal et al. (2017) who reported that the maximum spike length was produced at 150 kg of nitrogen and 100 kg of phosphorus per hectare, compared to 62.43 cm at the minimum nitrogen level and 76.54 cm at the maximum phosphorus level. Maximum number of florets/spike (26.31) was observed by Mane (2007) with broader spacing. This finding was supported by Gowthami et al. (2017), who discovered that a maximum of 57.29 floretsper spikes per hectare were generated using a fertiliser and potassium dosage of 100 kg N and 60 kg K. The longest flowering period was seen in gladiolus at the Horticulture Research Farm of the C.C.S. University, Meerut, in 2000-01 and 2001-02. Rana et al. (2005) reported that the medium spacing (30 20 cm) produced the longest flowering period. This maximum duration of flowering was seen in wider spacing with a medium dose of N and a higher dose of

Phosphorus. Maximum floret weight was recorded in crossandra with tighter spacing, according to Priyanka et al. (2017). The Khalaj (2012) had also supported this finding by reporting that increasing N dose from 0 to 250 kg/ha; florets weight also increased positively.

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