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Morphological characters as influenced by spacing and nutrients in seed propagated aggregatum onion (*Allium cepa* L. Var. *aggregatum* Don.) type Gnanamedu local

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Abstract : A study was conducted at Horticultural College and Research Institute, Coimbatore to find out the response of multiplier onion Gnanamedu local, a seedling type in respect of plant height, number of leaves and number of shoots. The experiment was laid out with 30 treatments and three replications in a split plot design. The main and sub plot treatments consist of three spacings *viz.*, 45x5, 45x10 and 45x15 cm and 10 combinations of nutrients involving three levels of N (20, 40 and 60kg ha^{-1}), three levels of P (20, 40 and 60kg ha^{-1}) and constant level of K (30 kg ha^{-1}) along with FYM (25 t ha^{-1}), *Azospirillum* at 2 kg ha^{-1} and phosphobacterium at 2 kg ha^{-1}. Organics alone and absolute control without nutrients was also adopted. The higher plant height was observed at closer spacing of 45x5 cm at 100th and 135th day of sowing. The plant height showed an increased trend with increasing level of nutrients. Interaction effect revealed that application of 60:60:30 kg NPK ha^{-1} along with FYM at 25 t ha^{-1}, *Azospirillum* at 2 kg ha^{-1} and phosphobacterium of 2 kg ha^{-1} with closest spacing of 45x5 cm recorded the higher plant height (48.5 cm) at 100th and 135th days of sowing. *(Key words : Onion, Spacing, Nutrients, Interaction)*

Multiplier onion (*Allium cepa* var. *aggregatum*) is one of the most important spice crops, valued for its unique pungency. It requires large quantities of readily available nutrients. Optimum plant density is important for the higher utilization of applied nutrients. Information on the response of aggregatum onion to population and different levels of nutrients would provide a basis for assessing the optimum plant density and levels of nutrients. The present study was, therefore conducted to find out the response of multiplier onion to different spacings and levels of organic, inorganic nutrients and biofertilizers in respect of plant height, number of leaves and number of shoots.

Materials and Methods

An investigation was carried out in aggregatum onion type Gnanamedu local at Horticultural College and Research Institute, TNAU, Coimbatore. The soil of experimental field was well-drained loam with a pH of 6.4. The experiment was laid out with 30 treatments and three replications in a split plot design. Three spacing, *viz.* S_1 45x5, S_2 - 45x10, and S_3 - 45x15 cm formed the main plot treatments. The subplot treatments consist of 10 combinations of nutrients *viz.*

M_1 - Control (No organic manures, no biofertilizer and no inorganic fertilizers)

M_2 - Recommended dose of inorganic fertilizer 30: 60: 30 kg NPK /ha as basal and 30 kg N / ha as top dressing after 30 days.

M_3 - 60: 60: 30 kg NPK +25 t FYM + 2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_4 - 40: 60: 30 kg NPK + 25 t FYM + 2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_5 - 20 : 60 : 30 kg NPK + 25 t FYM + 2 kg *Azospirillum* + 2 kg phosphobacterium/ha.

M_6 - 60: 60: 30 kg NPK + 2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_7 - 60: 20: 30 kg NPK + 2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_8 - 40: 40: 30 kg NPK + 2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_9 - 20: 20: 30 kg NPK +2 kg *Azospirillum* + 2 kg phosphobacterium /ha.

M_{10} - Organic alone ie.25 t FYM+2 kg *Azospirillum*+ 2 kg phosphobacterium /ha.

Farm Yard Manure was applied at 25 t ha^{-1} and *Azospirillum* and phosphobacterium each at 1 kg ha^{-1} as seed treatment and 2 kg ha^{-1} as soil application applied at the time of planting. The observations were recorded in five randomly selected plants in each replication. The height of the plant, number of leaves and number of suckers were counted on 65th, 100th and 135th day of sowing. The mean data were statistically analysed.

Table 1. Effect of spacing and nutrients on plant height (cm) at three stages of aggregatum onion

Treatments	65th day				100th day				135th day			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
M_1	14.12	14.92	10.19	13.08	20.17	18.93	15.25	18.11	29.11	28.35	26.20	27.89
M_2	17.14	18.01	15.08	16.74	25.17	22.18	19.92	22.42	35.38	33.35	32.46	33.73
M_3	23.97	21.53	20.60	22.03	35.17	32.77	30.31	32.75	48.53	46.12	44.79	46.48
M_4	22.67	20.28	19.54	20.83	32.65	30.51	28.23	30.46	45.87	43.75	42.58	44.07
M_5	22.62	20.51	19.61	20.91	30.52	28.85	26.37	28.58	44.63	41.14	40.41	42.06
M_6	21.49	19.14	18.41	19.68	28.44	26.38	24.08	26.30	40.94	38.45	37.39	38.93
M_7	21.54	19.11	18.63	19.76	27.61	25.26	23.33	25.40	38.53	36.50	35.22	36.75
M_8	19.30	18.09	16.29	17.89	26.33	23.33	21.02	23.52	37.67	35.89	34.56	36.04
M_9	16.43	17.19	13.33	15.65	24.63	21.27	18.96	21.62	31.13	32.40	30.55	32.36
M_{10}	15.08	15.96	12.04	14.36	23.01	20.01	15.93	19.65	30.39	30.37	28.44	29.73
Mean	19.44	18.47	16.37	18.09	27.37	24.93	22.34	24.88	38.52	36.63	35.26	36.80
	SE_d	CD			SE_d	CD			SE_d	CD		
S	0.03	NS			0.05	0.12			0.05	0.13		
M	0.17	NS			0.28	0.56			0.31	0.63		
S x M	0.30	NS			0.24	1.00			0.55	NS		
M x S	0.29	NS			0.46	0.93			0.46	NS		

Main plot - spacing (S) Sub plot - Nutrients (M)

Table 2. Effect of spacing and nutrients on number of leaves at three stages of aggregatum onion

Treatments	65th day				100th day				135th day			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
M_1	10.03	10.89	12.36	11.09	12.15	12.96	14.43	13.18	19.31	21.93	25.54	22.26
M_2	11.92	13.01	12.07	12.33	15.93	17.49	19.54	17.65	26.14	28.05	29.06	27.75
M_3	17.06	17.67	18.71	17.81	28.75	30.67	32.69	30.70	40.89	42.77	44.53	42.73
M_4	15.53	16.33	17.63	16.49	26.19	28.10	30.40	28.23	36.25	38.36	39.99	38.20
M_5	15.07	16.42	17.37	16.28	23.94	26.67	28.41	26.34	34.13	36.80	38.64	36.52
M_6	14.44	15.22	16.21	15.29	23.06	24.89	27.04	25.00	33.06	34.13	37.03	34.74
M_7	14.18	14.98	16.32	15.16	22.74	22.93	25.41	23.69	30.36	33.49	36.41	33.42
M_8	13.14	14.43	15.60	14.39	20.70	21.09	23.00	21.60	26.99	32.06	34.79	31.28
M_9	13.27	14.17	15.11	14.18	17.53	18.37	19.98	18.63	26.45	30.42	32.90	29.92
M_{10}	12.96	11.93	12.92	12.60	11.89	15.33	15.94	14.39	24.26	25.84	28.37	26.16
Mean	13.76	14.50	15.43	14.56	20.29	21.85	23.68	21.94	29.78	32.38	34.73	32.30
	SE_d	CD			SE_d	CD			SE_d	CD		
S	0.51	NS			0.05	0.13			0.22	0.53		
M	0.28	NS			0.10	0.20			0.38	0.78		
S x M	0.49	NS			0.55	1.12			0.67	2.04		
M x S	0.46	NS			0.58	1.05			0.64	1.28		

Main plot - spacing (S) Sub plot - Nutrients (M)

Table 3. Effect of spacing and nutrients on number of suckers per side shoots at 3 stages of aggregatum onion

Treatments	65th day				100th day				135th day			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
M_1	1.20	1.11	1.39	1.23	2.17	1.95	4.25	2.79	2.09	2.03	5.35	3.15
M_2	2.26	2.12	2.28	2.22	4.01	4.19	7.25	5.15	5.11	5.06	8.06	6.07
M_3	3.42	3.63	3.66	3.57	7.72	8.83	10.84	9.13	8.81	10.81	12.86	10.82
M_4	2.20	3.22	3.38	2.93	6.46	7.56	9.56	7.86	7.25	8.63	11.53	9.13
M_5	2.27	2.38	3.27	2.64	6.13	7.28	9.27	7.56	6.95	8.38	11.27	8.86
M_6	2.07	2.37	2.17	2.20	5.35	6.39	8.26	6.67	6.25	7.43	10.41	8.03
M_7	1.17	2.14	2.22	1.84	5.17	6.05	8.10	6.44	6.13	7.04	10.24	7.80
M_8	1.22	2.02	2.08	1.77	4.19	5.54	6.19	5.31	5.44	6.29	9.14	6.95
M_9	2.37	2.41	2.02	2.26	3.88	3.12	5.16	4.05	3.44	4.41	7.26	5.03
M_{10}	1.09	2.22	1.05	1.45	2.23	2.23	4.13	2.86	2.17	.3.07	6.17	3.80
Mean	1.92	2.36	2.35	2.21	4.73	5.31	7.30	5.78	5.36	6.31	9.22	6.96
	SE_d	CD			SE_d	CD			SE_d	CD		
S	0.01	NS			0.01	0.04			0.02	0.06		
M	0.07	NS			0.10	0.21			0.14	0.28		
S x M	0.12	NS			0.18	NS			0424	0.50		
M x S	0.11	NS			0.17	NS			0.23	0.46		

Main plot - spacing (S) Sub plot - Nutrients (M)

Results and Discussion

The results (Table 1 to 3) showed that the closest spacing of 45x5 cm recorded the tallest plants at all stages. The closer spacing would have led to the greater inter competition of plants for available nutrients and encouraged the apical dominance resulting in the tallest plants as reported by Shanthi and Balakrishnan (1989). Wider spacing of 45x15cm accounted for the higher number of leaves and number of shoots at 100 th and 135th day of sowing which might be due to overcrowding and mutual shading of plants. Janardhan *et al* (1993) recorded the higher number of leaves at wider spacing in onion.

An improvement in plant height was more pronounced with enhancement in nutrient levels as evidenced in the treatment (M_1) at 100th and 135th day of sowing involving combination of organic manure FYM (25 t ha^{-1}), inorganic fertilizers (60:60:30 kg NPK ha^{-1}), *Azospirillum* at 2 kg ha^{-1} and phosphobacterium 2 kg ha^{-1}. This might be due to sufficient quantity of nutrients made available in the treated plots and also increased level of uptake of nutrients, which resulted in better growth. Singh *et al.* (1992) recorded in onion similar responses in plant height due to addition of nutrient. The number of leaves and number of shoots per plant showed an increase with higher levels of nutrient application (M_2). An enhanced rate of release of nitrogen from urea, FYM and fixation of atmospheric nitrogen by *Azospirillum* which in turn might have resulted in the increased production of leaves. This also corroborated with the results obtained by Baloch *et al.* (1991) in onion, Parthiban *et al* (1992) in tuberose and Paramaguru and Natarajan (1992) in chilli.

In a field experiment, the effect of spacing and organic manure, biofertilizers and inorganic was studied on the seed propagated aggregatum onion type Gnanamedu Local. The higher plant height was recorded at closer spacing of 45x5 cm at 100th and 135th day of sowing. The number of leaves and number of shoots were higher at wider spacing of 45x15 cm at 100th and 135th day of sowing. The plant height showed an increased trend with increasing level of nutrients. The interaction effect revealed that application of 60:60:30 kg NPK ha^{-1} along with FYM at 25 t ha^{-1}. *Azospirillum* -at 2 kg ha^{-1} and

phosphobacterium at 2 kg ha^{-1} with closest spacing of 45x5 cm recorded the higher plant height (48.5 cm) at 100th and 135th of sowing.

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Effect of planting density and nutrients on bulb development and flowering in seed propagated aggregatum onion *(Allium cepa* L. Var. *aggregatum* Don.) type Gnanamedu local

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Abstract : An experiment was conducted at Horticultural College & Research Institute to find out the response of aggregatum onion to different spacing and levels of organic, inorganic and biofertilizers in respect of bulb diameter, bulb length, shape index and flowering. The experiment was laid out in split plot design with 30 treatments replicated thrice. Three spacing *viz.*, S_1 45x5, S_2 45x10, and S_3 45x15 cm formed the main plot treatments. The subplot treatments consist of 10 combinations involving three levels of N (20, 40 and 60 kg ha^{-1}), three levels of P (20, 40 and 60 kg ha^{-1}) and constant level of K (30 kg ha^{-1}) along with FYM 25 t ha^{-1}, *Azospirillum* at 2 kg ha^{-1} and phosphobacterium at 2 kg ha^{-1}. An organics alone and absolute control without nutrients were also adopted. The increase in length of bulb and shape index were higher at closest spacing of 45x5 cm, while the widest spacing of 45x15 cm registered the greater bulb diameter. Manurial treatments had significant influence on the bulb characters, which showed an increasing trend with increasing level of nutrients. Spacing and nutrients had no influence on the days taken for flower initiation, days to 50 per cent flowering and days for maturity. Interaction effect revealed that application of 60:60:30 kg NPK ha^{-1} , FYM at 25 t ha^{-1} , *Azospirillum* at 2 kg ha^{-1} and phosphobacterium 2 kg ha^{-1} along with closest spacing of 45x5 cm recorded the higher bulb length (5.70 cm) and shape index (1.09 %).
(Key words : Onion, Planting density, Bulb development, Flowering).