

## Effect of Plant Geometry on Yield and Economics of Pumpkin in Lateritic Soil of Western Orissa

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### Abstract

Field experiment was carried out with nine treatments comprising three different rows and three different plant spacing in a randomized block design for two years to find out the optimum spacing for pumpkin in the lateritic soil of western Orissa. The pooled results showed that row and plant spacing of 90 × 60 cm was best among the treatments giving maximum fruit weight (3.35 kg), yield per hectare (273 q), gross return (Rs 81,810) and net return (Rs. 63170) per hectare.

**Key words :** Plant geometry, Yield, Economics, Pumpkin.

Pumpkin (*Cucurbita moschata* Duch ex Poir) is an important cucurbitaceous vegetable crop grown in many sub-tropical and tropical parts of the world. Low cost of production, good keeping quality and adaptability to a wide range of climatic conditions, favors popularization of the crop. It is mainly grown for its mature and immature fruits which are considered as a good source of carotene (50mg/100g of edible fruits), a precursor of vitamin A. Introduced to India from the South American center of crop origin by foreign navigators and emissaries, in India pump-

kin is grown all over the country on commercial scale (1). It is grown in around 37 thousand hectares of area in Orissa with 39.23 thousand tones of production in an average productivity of 10.5 tonnes/ha only which is much less than the national average. The production of crop depends on several components in which plant population assumes great importance in yield maximization of a crop. The optimum plant population (spacing) helps not only in obtaining increased production of better quality but also in proper utilization of land and other inputs.

**Table 1.** Effect of plant geometry on yield and economics of pumpkin during 2002.

Treatments (spacing)	Plant population (per ha)	Individual fruit weight (kg)	Fruit yield (q/ha)	Gross return (' 000Rs/ha)	Cost of cultivation (' 000Rs/ha)	Net profit ('000Rs/ha)
T <sub>1</sub>	13888	2.95	216.6	64.98	15.99	49.00
T <sub>2</sub>	18055	2.05	270.3	81.09	19.60	61.50
T <sub>3</sub>	27777	2.14	278.4	83.52	23.48	60.05
T <sub>4</sub>	18506	3.42	280.4	84.12	18.00	66.12
T <sub>5</sub>	22569	2.11	263.9	79.17	22.94	56.94
T <sub>6</sub>	34722	1.83	198.4	59.52	26.75	32.78
T <sub>7</sub>	27777	1.92	222.4	66.72	23.48	43.25
T <sub>8</sub>	36111	1.72	164.1	49.23	27.89	21.34
T <sub>9</sub>	55555	1.81	184.4	55.32	35.70	19.63
SE ±		0.15	5.10			
CD (0.05)		0.58	15.32			
CV (%)		1.47	3.83			

**Table 2.** Effect of plant geometry on yield and economics of pumpkin during 2004.

Treatments (spacing)	Plant population (per ha)	Individual fruit weight (kg)	Fruit yield (q/ha)	Gross return ('000Rs/ha)	Cost of cultivation ('000Rs/ha)	Net profit ('000Rs/ha)
T <sub>1</sub>	13888	2.58	2.10	62.91	16.26	46.665
T <sub>2</sub>	18055	2.03	243	72.90	20.36	52.54
T <sub>3</sub>	27777	2.12	254	76.26	23.66	52.60
T <sub>4</sub>	18506	3.28	265	79.50	19.28	60.22
T <sub>5</sub>	22569	2.11	226	67.71	23.34	44.37
T <sub>6</sub>	34722	1.70	146	43.71	27.15	16.56
T <sub>7</sub>	27777	1.80	217	65.19	24.24	40.95
T <sub>8</sub>	36111	1.59	112	33.63	28.98	4.65
T <sub>9</sub>	55555	1.74	127	38.10	36.94	1.16
SE ±		0.06	3.30			
CD (0.05)		0.23	9.50			
CV (%)		6.52	2.90			

### Methods

A field experiment was conducted during summer 2002 and 2004 at RRTTS, Chiplima (OUAT) of Sambalpur district to study the effect of plant geometry on growth and yield of pumpkin as the farmers are getting low yield due to lack of proper plant population per unit area. The experiment was laid out in randomized block design with three replications and nine treatments consisting of different row and plant spacing as detailed below.

T<sub>1</sub> : 120 × 60 cm    T<sub>4</sub> : 90 × 60 cm    T<sub>7</sub> : 60 × 60 cm  
 T<sub>2</sub> : 120 × 45 cm    T<sub>5</sub> : 90 × 45 cm    T<sub>8</sub> : 60 × 45 cm  
 T<sub>3</sub> : 120 × 30 cm    T<sub>6</sub> : 90 × 30 cm    T<sub>9</sub> : 60 × 30 cm

Seeds of summer bush pumpkin cv Banaras Lo-

cal were sown in well prepared pits during summer 2002 (28 March 2002) and 2004 (8 March 2004). Fertilizers were applied at 60 kg N, 30 kg P<sub>2</sub>O<sub>5</sub> and 75 kg K<sub>2</sub>O/ha and intercultural operations were done uniformly in all plots as and when needed. Observations on individual fruit weight, yield and economics were recorded during both the years. Pooled data of two years were also calculated and analyzed statistically as suggested by Panse and Sukhatme (2).

### Results and Discussion

It is revealed that during 2002 row and plant spacing of 90 × 60 cm with 18,506 plants/ha produced fruits with maximum individual weight although the yield per hectare was at par with T<sub>2</sub> and T<sub>3</sub> (Table 1).

**Table 3.** Effect of plant geometry on yield and economics of pumpkin (pooled data for 2002 and 2004. Sale price of fruits = Rs 300/-per quintal.

Treatments (spacing)	Plant population (per ha)	Individual fruit weight (kg)	Fruit yield (q/ha)	Gross return ('000 Rs/ha)	Cost of cultivation ('000 Rs/ha)	Net profit ('000 Rs/ha)
T <sub>1</sub>	13888	2.77	213	63.93	16.125	47.805
T <sub>2</sub>	18055	2.04	257	76.98	19.98	57.00
T <sub>3</sub>	27777	2.13	266	79.89	23.57	56.32
T <sub>4</sub>	18506	3.35	273	81.81	18.64	63.17
T <sub>5</sub>	22569	2.11	245	73.44	22.79	50.65
T <sub>6</sub>	34722	1.77	172	51.60	26.95	24.65
T <sub>7</sub>	27777	1.86	220	65.94	23.86	42.08
T <sub>8</sub>	36111	1.66	138	41.43	28.435	12.995
T <sub>9</sub>	55555	1.78	156	46.71	36.32	10.39
SE ±		0.10	4.20			
CD (0.05)		0.40	12.40			
CV (%)		3.99	3.40			

However, net return was found to be highest at T<sub>4</sub> (Rs 66,120 per hectare). The minimum value for individual fruit weight was recorded at the row and plant spacing of 60 × 45 cm where as net profit was least at T<sub>9</sub>.

Similarly, in 2004, T<sub>4</sub> produced maximum individual fruit weight (3.28 kg) and yield per hectare (265 q) and highest gross and net return of Rs 79,500 and 60,220 respectively. The corresponding minimum value was recorded in T<sub>8</sub> except the economic returns which was minimum at row and plant spacing of 60 × 30 cm (Table 2).

The analysis of the pooled data of both the year confirms that the individual fruit weight was highest at the spacing of 90 × 60 cm (T<sub>4</sub>) with highest fruit yield per hectare (273q) which was at par with T<sub>3</sub> (266 q) but the gross and net return were highest at T<sub>4</sub> with the corresponding values of Rs 81,810 and 63,170 per hectare (Table 3). The minimum individual fruit weight and yield were noted at the spacing of 60 × 45 cm whereas the gross and net return were found to be minimum at 60 × 30 cm spacing.

Results of 2002 indicated that a spacing of 90 × 60 cm with plant population of 18,506/ha produced the highest yield (280.4 and 265.0 q/ha) and heaviest fruits (3.42 and 3.28 kg). High yield in closer spacing is the result of more number of plants accommodated per unit area leading to more yield of the crop. Noon (3) also obtained the highest yield of squash melon at the closest spacing. The highest net profit of Rs 66,120 × and 60,220 per ha was obtained from the treatment 90 cm × 60 cm. The pooled data of these

two years revealed that a spacing of 90 cm × 60 cm gave highest fruit yield (273 q/ha) with heaviest fruits (3.35 kg) and also recorded the highest gross net return of Rs 81,810 and Rs 63,170 per hectare respectively. This might be due to the reason that the optimum row and plant spacing provides adequate availability of inputs like nutrients, moisture and sun light. This adds to greater photosynthetic activity and accumulation of dry matter resulting to higher individual fruit weight and ultimately the yield. As the gross and net return of produce are the linear function of yield and quality, these factors reached at its highest due to higher yield with greater sized fruits at adequate spacing. Similar findings have been recorded by Kanwar et al. (4) and Nath et al. (5). Therefore, it may be concluded that a spacing of 90 cm × 60 cm is beneficial for commercial cultivation of pumpkin in the lateritic soil of western Orissa.

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