

## Effect of Different Planting Dates and Spacing on Growth and Yield of Garlic Cv. Bianco

Muhammad Jamroz<sup>1</sup>, Muhammad Ishtiaq<sup>2</sup>, Nisar Naeem<sup>3</sup>, Niaz Muhammad<sup>3</sup>,  
Buzerg Jamiher<sup>4</sup> and Javed Iqbal<sup>1</sup>

<sup>1</sup>NWFP Agriculture University, Peshawar, Pakistan

<sup>2</sup>Department of Horticulture NWFP, Agriculture University, Peshawar, Pakistan

<sup>3,4</sup>Agricultural Research Institute, Tarnab, Peshawar, Pakistan

**Abstract:** An experiment on the effect of different planting dates and spacing on the growth and yield of garlic cv. Bianco was carried out at Malakandher Research Farm, NWFP Agricultural University Peshawar during the year 1995-96. Four different plant spacing i.e. 4 cm, 8 cm, 12 cm and 16 cm were kept at four different planting dates i.e. 1st November, 15th November, 30th November and 15th December. The data revealed that both planting dates and spacing significantly affected the number of days to emergence, number of days to maturity, plant height, number of leaves/plant, number of cloves/bulb, bulb size, bulb weight and yield (Kg/ha). Maximum plant height (87.66 cm), number of leaves (8.10), number of cloves/bulb (34.46) bulb size (19.71 cm), bulb weight (44.80 g) and total yield (14166.66 kg/ha) were recorded in plants that were sown on 1st November with plant spacing of 8 cm, while minimum values were recorded for the mentioned parameters in plots sown on 15th December with plant spacing of 4 cm. Maximum number of days to emergence (12.66) and maturity (198.0) were found in plants sown on 15th December with plant spacing of 4 cm. It is suggested that garlic should be sown before the mid of November with plant spacing of 8 cm under the agro-climatic conditions of Peshawar.

**Key words:** Planting dates, growth yield, Garlic Cv. Bianco

### Introduction

Garlic (*Allium sativum*) belongs to the family Amaryllidaceae. It is popular spice and is consumed throughout the country. As the performance of aerial plant parts totally depend upon the growth and development of subterranean plant parts, therefore, proper space and environment should be provided to the root system. Similarly different plant species and varieties require specific season for the completion of their growth and developmental stages i.e. vegetative and reproductive, that is why vegetables are grouped as summer and winter vegetables. For this very reason vegetable species should be planted at specific time of the season. Garlic production is very low in Pakistan specifically in NWFP as compared to other advanced countries of the world. Many factors are responsible for this low yield. Beside other planting time and plant spacing are the key factors, which affect the yield of crop. Keeping in view the importance of spacing and sowing time this project was carried out. Peixoto et al. (1983) recorded the best planting time from March to April for Chines, March for Centenario, and April for Gigante delavina. They also noted that centenario gave highest yield (10 tones/ha) when planted in February or March while the remaining gave better performance in February. Rahim et al. (1984) also recorded the highest yields 15 tones/ha in case of the cloves which were taken from the large mother bulbs and planted on 13 October at 100 plants/m<sup>2</sup>. Rudge (1984) reported the highest yield 10.74 tones/ha planting on 8 June and 8 July. He also recorded that first grade bulbs were higher with the latter planting date. Ferrararisi (1985) reported trials on sowing density. He recorded that yield increased with increasing plant density but size is reducing. He also noted that a density of 30-40 plants/m<sup>2</sup> has the best results. Park and Lee (1989) planted Northern and Southern ecotypes of garlic on eight dates from 2 September to 1 February. They recorded that greatest bulb weight and diameter with the earliest planting in the northern ecotype, but the number of cloves/bulb were higher in the southern ecotype, but the number of cloves/bulb were higher in the southern ecotype. They also recorded that delay in planting will increase plant height and number of leaves. Singh and Phogat (1989) reported in 2 year trials with a local cultivar, the cloves were planted at 20x10 cm on 10, 20 or 20 September or 10, 20 or

30 October. Data were tabulated on average plant height, number of leaves/plant, bulb length and diameter, number of cloves/bulb weight and yield. In both years the bulb yield was highest (131.8 and 131.5 q/ha) from the planting on 20 September and declined with delayed planting to 59.4 and 59.5 q/ha from planting on 20 October. Autumn planted garlic generally showed little shoot growth in the autumn. Cultivars adapted to cold areas showed less growth in the autumn than those adapted to warm areas, and late maturing, cold adapted cultivars showed the least growth. Warm adapted cultivars gave lower yields and smaller bulbs when planted in spring than when planted in autumn, but cold adapted cultivars did not show this effect. Maturity date was hardly effected by planting date, but spring planted, cold adapted cultivars continued vigorous bulb growth longer than those planted in autumn. When planted in spring, most cultivars formed intermediate and/or single cloved bulbs. The frequency of abnormal bulb development was lower in cold adapted than in warm adapted cultivars and lowest in the late maturing, cold adapted cultivars. Spring planted garlic gave the highest yields when the cloves were first stored at outdoor temperatures and then transferred to B 2.C from early winter until planting, spring planting of late maturing, cold adapted cultivars in cold areas was considered to be promising. Anna (1995) reported in trials at Mussomeli in 1991-93, garlic cv. paceco cloves were planted at densities of 20,25,33 or 50 plants/m<sup>2</sup>. Density had no effect on sprouting or growth rate. Bulb yield increased with increasing density but average bulb size decreased. Bulb yield were 47% higher from a planting density of 50m<sup>2</sup> than from a density of 20/m<sup>2</sup>.

### Materials and Methods

An experiment to find out the effect of different planting dates and spacing on the growth and yield of garlic cv. Bianco was carried out at Malakandher Research Farm, NWFP Agricultural University Peshawar, during the year 1995-96. The cloves were obtained from vegetable section, Agricultural Research Institute Tarnab, Peshawar. The cloves were sown on four different dates i.e. 1st November, 15 November, 30th November and 15th December 1995 and were spaced at 4 cm, 8 cm, and 12 cm and 16 cm with row to row distance of 15 cm and the area of the subplot was 4 cm<sup>2</sup>. Irrigation and

weeding were done whenever necessary. The experimental plot was ploughed, well prepared and 150 kg of nitrogen in the form of ammonium nitrate per hectare was applied in two split doses. There were 16 treatments and two factors, Randomized Complete Block design with split plot arrangement, replicated three times was used. The experimental plot was regularly observed and data were recorded on Day to emergence, Plant height (cm), Number of leaves per plant, Days to maturity, Bulb weight (g), Number of cloves/bulb and Yield/hectare (kg/ha).

**Results and Discussion**

The results pertaining to number of days to emergence of garlic cv. Bianco are given in Table 1. The results show that planting dates of 1st. November with the spacing of 8 cm were the most effective in minimizing number of days to emergence, followed by planting space of 4 cm which were sown on 15th November, while maximum number of days to emergence were recorded in the plants that were sown on 15th December with plant spacing of 16 cm. The reason might be prevailing low temperature in the severe cold months of the session. As temperature influences all the vital activities of the plant species, the low temperature might have delayed the sprouting.

The result pertaining to the plant height are given in Table 2. The results show that planting of 1st. November with spacing of 8 cm was the most effective in increasing the plant height. Maximum plant height was recorded in the plants sown on 1st. November with a plant spacing of 8 cm. While minimum plant height was noted in the plants sown on 15th December with plant spacing of 4 cm.

Table 1: Effect of different planting dates and spacing on days to emergence of garlic cv. Bianco

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st. Nov.	10.0de	9.33e	12.00bc	12.33bc	10.92c
15th Nov.	9.67de	11.00cd	12.67ab	12.67ab	11.50bc
30th Nov.	9.67de	12.00bc	12.67ab	13.00ab	11.83ab
15th Dec.	14.00a	11.00cd	12.33bc	12.33bc	12.42a
Mean	10.84b	10.83b	12.42a	12.58a	

L.S.D. value for time at 5% level of probability = 0.9079  
 L.S.D. value for spacing at 5% level of probability = 0.7297  
 L.S.D. value for interaction at 5% level of probability = 1.459

Table 2: Effect of different planting dates and spacing on plant height (cm) of garlic cv. Bianco

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st. Nov.	61.67	87.67	78.000	77.333	76.16 a
15th Nov.	59.00	84.00	71.670	77.000	72.91 b
30th Nov.	56.00	81.67	73.000	72.000	70.66 bc
15th Dec.	51.00	77.67	69.33	73.000	67.74 c
Mean	56.91 b	82.75 a	73.00 b	74.83 b	

L.S.D. value for time at 5% level of probability = 3.195  
 L.S.D. value for spacing at 5% level of probability = 3.030

Table 3: Effect of different planting dates and spacing on number of leaves per plant of garlic cv. Bianco.

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st Nov	7.13	8.10	7.46	7.88	7.64 a
15th Nov	6.80	7.60	7.46	7.88	7.19 ab
30th Nov	6.55	7.57	7.08	6.86	7.01 b
15th Dec	6.48	7.20	7.05	6.59	6.83 b
Mean	6.64 c	7.72 a	7.17 a	7.16 b	

L.S.D. value for time at 5% level of probability = 0.4975  
 L.S.D. value for spacing at 5% level of probability = 0.2955

Table 4: Effect of different planting dates and spacing on Days to maturity of garlic cv. Bianco.

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st. Nov.	169.33 f	173.66 ef	175.00 ef	169.33 f	171.83 c
15th Nov	176.00ef	185.66 cd	186.33 cd	184.33abcd	184.33b
30th Nov	191.33abc	181.33de	188.33bcd	190.33ab	189.33ab
15th Dec	198.00 a	190.33abc	191.00abc	191.00abc	192.58 a
Mean	183.66	182.75	185.16	186.50	

L.S.D. value for time at 5% level of probability = 8.293  
 L.S.D. value for interaction at 5% level of probability = 8.778

Table 5: Effect of different planting dates and spacing on number of cloves per bulb of garlic cv. Bianco.

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st Nov	17.76	32.46	26.00	23.63	24.69a
15th Nov	24.84	27.56	22.70	20.54	23.91a
30th Nov	15.74	16.64	27.28	25.49	21.29b
15th Dec	17.02	23.62	19.33	23.70	2096b
Mean	18.89c	25.07a	23.57ab	23.31b	

L.S.D. value for time at 5% level of probability = 2.383  
 L.S.D. value for spacing at 5% level of probability = 1.661

Significant differences were also recorded for other treatments of plant spacing and planting dates. The results are in agreement with Takagi (1989) and Park and Lee (1989) who noted that shoot growth and plant height was maximum when garlic cultivars were planted in early autumn or from 2nd September to 1st February.

The results pertaining to number of leaves per plant are given in Table 3. The results show that planting dates of 1st. November with planting space of 8 cm was most effective in increasing the number of leaves per plant. Maximum number of leaves/plant was observed at the planting space of 8 cm that were sown on 1st. November followed by planting space of 12 cm that were sown on 15th November significant difference was also observed between number of leaves/plant

Table 6: Effect of different planting dates and spacing on weight of bulb (gm) of garlic cv. Bianco.

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st. Nov.	6.23f	44.80a	33.70b	24.56de	27.32a
15th Nov	5.20f	34.06b	28.53c	25.26cde	23.28b
30th Nov	5.10f	33.43b	27.96cd	24.90de	22.85bc
15th Dec	4.33f	27.90cd	24.90de	24.20e	20.33c
Mean	5.21d	35.05a	28.77b	27.73c	

L.S.D. value for time at 5% level of probability = 2.908  
 L.S.D. value for spacing at 5% level of probability = 1.759  
 L.S.D. value for interaction at 5% level of probability = 3.518

Table 7: Effect of different planting dates and spacing on total yield (kg/ha) of garlic cv. Bianco.

Time	Spacing				Mean
	4 cm	8 cm	12 cm	16 cm	
1st. Nov.	4333.33	14166.66	12250.00	10250.00	10250.00a
15th Nov	3916.66	13866.66	11583.33	9500.00	9666.66a
30th Nov	4333.33	12333.33	10666.66	8750.00	9020.83ab
15th Dec	2750.00	12914.66	10916.66	6416.66	8250.00b
Mean	3833.33d	13270.83a	11334.16b	8729.16c	

L.S.D. value for time at 5% level of probability = 1317  
 L.S.D. value for spacing at 5% level of probability = 1007

recorded for different planting dates with different plant spacing. It is obvious from the data that there is a remarkable difference between the number of leaves/plant at planting date of 1st November with space of 8 cm and planting date of 15th December with spacing of 4 cm. These results are in agreement with Park and Lee (1989) who noted that planting garlic cv. from 25 September to 1 February increased plant height and number of leaves/plant.

The result pertaining to the days to maturity are given in Table 4. The results show that planting garlic on 1st. November with planting spacing of 8 cm mature early. While number of

days to maturity was maximum when garlic was planted on 14th December with the spacing of 16 cm. These results are in accordance with Peixoto *et al.* (1983) and Rahim *et al.* who also found that best planting dates are October and November. The result pertaining to the number of cloves/bulb are given in Table 5. The results shows that planting date of 1st November with spacing of 8 cm was the most effective in increasing the number of cloves/bulb. Maximum number of cloves/bulb were recorded in the plant spacing of 8 cm sown on 1st November followed by planting space of 12 cm with planting date of 15th November. It is obvious from the data that there is a remarkable difference between the number of cloves/bulb at planting date of 1st November with plant spacing of 4 cm. These results are in agreement with Scheffer (1985) who recorded that bulb from early plantings contained more cloves and have more weight. Similar results were obtained by Singh and Phogat (1989) they reported that planting local cultivar of garlic from September to October give more number of cloves/bulb and hence the yield is increased. The result pertaining to the weight of bulbs are given in Table 6. The results shows that planting date of 1st November with spacing of 8 cm was the most effective in increasing the weight of bulb. Maximum bulb weight was observed in the plants sown on 1st November with spacing of 8 cm followed by spacing of 12 cm sown on 15 November. It is obvious from the data taken that there was a remarkable difference in bulb weight obtained from the plants sown on 1st November with spacing of 8 cm and those sown on 15 December with spacing of 4 cm. These results are in agreement with the results are in agreement with the results of Rahmand and Talukdar (1986), Park and Lee (1989), Singh and Phogat (1989) and D-Anna (1995) who also found that bulb weight was highest from earlier planting. The result pertaining to the yield per hectare are given in Table 7. The results shows that planting date of 1st November with spacing of 8 cm was the most effective in increasing the total yield. Maximum total yield were recorded at spacing of 8 cm with planting date of 1st November followed by spacing of 12 cm with planting date of 15th November. It is obvious from the data that there is a remarkable difference in the total yield of garlic cv. Bianco sown on 1st November with spacing of 8 cm and those sown on 15th December with spacing of 4 cm. These results are in agreement with Peixoto *et al.* (1983), Scheffer (1985), Rehmand and Talukdar (1986) Park and Lee

(1984), Singh and Phogat (1989), Savon (1992) Lipinski (1993) and Orłowski and Rekowski (1993). All of the above mentioned researchers recorded that highest total yield of garlic was recorded on the earliest planting date mostly during the period of September to October to November.

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