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Full Length Research Paper

Effect of age of bulb and spacing on yield and yield attributes of Kalazeera (*Bunium persicum*. Boiss)

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The experiments were conducted for 3 and 4 year old bulbs, respectively. The age of bulbs affect most of the characters significantly. All the morphological as well as yield parameters except number of umblets (umbel^{-1}) showed significant increase with increase in the age of bulbs. Similarly, the effect of spacing was also found significant for most of the parameters studied except plant height. The yield of 230 and 245 kg ha^{-1} were obtained for 3 and 4 years old bulbs, respectively with the optimum spacing of 20 × 25 cm.

Key words: Age of bulb, spacing, yield attributes, yield, kalazeera.

INTRODUCTION

Kalazeera (*Bunium persicum*.Boiss) is one of the important medicinal plant that rows in mountainous regions and has been used in the far distant past. It is a high value herbaceous spice widely used for culinary, flowering, perfumery and carminative purposes. It is known worldwide for its medicinal value as Ibn Sina and Heravi have been mentioned some of pharmacological characteristics of black zira in their great scientific paper work. In addition to the medicinal properties of black zira, it has been used to make food tasty with good smell (Figure 1). Aromatic compounds (14.6%) and essential oils (8.75%) are the major chemical constituents of *B. periscum* and carvone (44%) is the main component of the essential oil of black zira (Khosravi, 1993).. Besides, being a source of essential oils rich in terpenoids and phenylpropanoids, polyene and phototoxic furanocoumarins are typical of this family (Sofi and Singh, 2009).It has received very little attention in terms of development and standardization. A few experiments have been already done on some agronomic parameters. The optimum seed rate of black zira is 100 and 60 kg per hectare to produce the highest bulb yield with suitable bulb diameter for one year old bulb and two years old bulb in nursery, respectively (Faravani and Rahimian, 1998). Considering the fact that black zira plant does not go for flowering until the third and or fourth year, thus using nursery can provide more care in small planting area with low expense from seed establishment till bulb transferring to the field after two years and it is easy to transplant black zira bulbs in the field with the optimum density and planting pattern to produce a high seed yield for 8 to 9 years (Khosravi, 2005; Sofi and Singh, 2009). The low productivity is mainly due to poor crop management practices, inadequate planting density, high weed incidence, disease, insect damage, and lack of nutritional processing techniques. The aim of this experiment is to achieve suitable age of bulbs and plant density in the field.

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MATERIALS AND METHODS

This present study was carried out at the Experimental Farm of Kalazeera Research Station, SKUAST-K, Gurez. The experiment was laid out in randomized Block design in sandy loam soil having pH range of 6.75. Treatments consisted of two levels of age of bulbs *viz.,* 3 year old and 4 year old bulbs and 5 spacing levels *viz.*, 15 ×10, 20×15, 20×20, 25×20 and 30×25 cm. All the cultural operations were done as per the package of practices. The crop was irrigated and regularly weeded at an interval of 10 to 15 days. The fertilizers were applied in the ratio of 60:35:30 (Nitrogen:Phosphorus:Potash). Full dose of P and K alongwith 1/4th

Figure 1. Field view of Kalazeera (*Bunium persicum*. Boiss).

dose of nitrogen were added at the time of land preparation; while the rest of N was added in 3 split doses, that is, 1/4th after snow melting, 1/4th at the time of bolting and the rest 1/4th at the time of flowering. FYM at 20 t/ha was also added at the time of field preparation. During 2nd year, full doses of P and K alongwith 1/3rd dose of nitrogen were added after now melting. Next, 1/3rd dose of N was added at the time of bolting, while the rest 1/3rd was applied at the time of flowering. Nitrogen was added in the form of urea, P in Single Super Phosphate and K in Muriate of Potash. The crop was harvested in the first week of July during both years.

Ten plants were randomly selected from each treatment for recording observations on plant height (cm), number of branches plant^{-1}, number of umbels plant^{-1} number of umblets umbel^{-1}, number of seeds umbel^{-1} and number of seeds plant^{-1}. Seed yield was obtained as seed yield plant^{-1}, seed yield m^{-2} and seed yield (kg ha^{-1}). The statistical analysis for each character was carried out as mean values. The data was subjected to randomized block analysis as described by Panse and Sukhtame (1978) and Chandel (1984). The results have been interpreted on the basis of "F" test and critical difference (CD) at 5 percent level of significance. The two years data were subjected to pooled analysis with a view to arriving at a valid conclusion and for better appraisal of results.

EXPERIMENTAL RESULTS

The data presented in Table 1 revealed that plant height increased significantly with increase in bulb age. The average height of 38.31 and 39.87cm was recorded for 3 and 4 year old bulbs, respectively. However, the effect of spacing and its interaction with age of bulb was found non-significant. Spacing 30 × 25 cm showed maximum height of 39.76 cm while minimum height 37.92 was recorded for 20 ×15 cm spacing. Both bulb age and spacing showed significant influence on number of branches plant^{-1}. The number of branches (primary, secondary and tertiary) that were recorded for 3 years old bulbs were 1.31, 3.35 and 1.23, respectively. Similarly, spacing of 30 × 25 cm showed maximum number of primary, secondary and tertiary branches, that is, 1.48, 5.02 and 1.34, respectively.

The effect of age of bulb on number of umblets umbel^{-1} was found non-significant; however, the effect of spacing was found significant (Table 2). With increase in spacing there was increase in number of umblets umbel^{-1}. Maximum (11.30) and minimum value (10.30) were recorded for the spacing of 30 × 25 cm and 15 × 10 cm, respectively. Number of seeds umbel^{-1} was significantly affected by age of bulbs. The 4 year old bulbs showed maximum number of seeds umbel^{-1} (146.20), while minimum number was exhibited by 3 year old bulbs (137.80). With increase in the spacing level the number of seeds seeds^{-1} increased. Spacing of 30 × 25 cm and 25 × 20 cm showed the maximum value (150.50), while dense plant population, that is, 15 × 10 cm spacing showed lowest number of seeds umbel^{-1}. Similarly for number of seeds plant^{-1}, the highest value (712) was exhibited by 4 year old bulbs, while the lowest value was obtained from 3 year old bulbs (664). In case of spacing, 30 × 25 cm being statistically at par with 25 × 20 cm showed maximum number of seeds plant^{-1}, that is, 968 and 948, respectively.

Data presented in Table 3 revealed that seed yield plant^{-1}, seed yield m^{-2} as well as seed yield kg ha^{-1} increased with increase in the age of bulbs. Maximum seed yield (0.89 g plant^{-1}, 22.10 g m^{-2} and 220.92 kg ha^{-1}, respectively) were recorded for 4 years old bulbs whereas, the values 0.83 g plant^{-1}, 20.27 g m^{-2} and 202.74 kg ha^{-1}, respectively were recorded for 3 year old bulbs. Seed yield plant^{-1} showed the increasing trend with increase in the spacing level. Plant spacing of 30 × 25 cm at par with 25 × 20 cm showed highest seed yield plant^{-1} 1.21 g and 1.18 g, respectively, while the lowest value was recorded for 15 × 10 cm spacing. Similarly, in case of seed yield m^{-2}, the increase was found up to 25 × 20 cm, thereafter a significant reduction was observed. The maximum seed yield m^{-2} (23.75 g) was showed by 25 × 20 cm while, lowest seed yield m^{-2} (16.10 g) was observed for the spacing of 30 × 25 cm. Seed yield (kg ha^{-1}) increased with the increase in spacing up to 25 × 20 cm and thereafter decreased. Maximum seed yield (237.5 kg ha^{-1}) was recorded for 25 × 20 cm followed by 20 × 20 cm (229.3 kg ha^{-1}) and 20 × 15 cm (228.0 kg ha^{-1}). The later two spacings were at par with each other. Minimum seed yield (161.0 kg ha^{-1}) was recorded for the spacing of 30 × 25 cm.

The interaction studies revealed that maximum seed yield plant^{-1} (1.24 g), seed yield m^{-2} (24.50) as well as seed yield kg ha^{-1} (245 kg) was observed for 4 year old bulbs under the spacing of 30 × 25, 25 × 20 and 25 × 20 cm, respectively which was followed by 3 year old bulbs under the same spacings.

DISCUSSION

Morphological attributes like plant height, number of tillers

Table 1. Effect of age of bulbs and spacing on plant height and branches plant^{-1} in kalazeera.

Spacing	Plant height (cm)			Primary branches plant^{-1}			Secondary branches plant^{-1}			Tertiary branches plant^{-1}		
	3 year old	4 year old	Mean	3 year old	4 year old	Mean	3 year old	4 year old	Mean	3 year old	4 year old	Mean
15 × 10 cm	38.23	38.92	38.58	1.04	1.08	1.06	1.05	1.08	1.07	1.07	1.24	1.16
20 × 15 cm	37.52	38.31	37.92	1.31	1.35	1.33	2.35	2.52	2.44	1.23	1.32	1.28
20 × 20 cm	38.03	38.97	38.50	1.37	1.45	1.41	3.51	3.62	3.57	1.25	1.34	1.30
25 × 20 cm	38.85	40.56	39.71	1.42	1.50	1.46	4.84	4.92	4.88	1.28	1.35	1.32
30 × 25 cm	38.93	40.60	39.76	1.44	1.52	1.48	4.98	5.06	5.02	1.30	1.39	1.35
Mean	38.31	39.47		1.32	1.38		3.35	3.44		1.23	1.33	
$CD_{0.05}$												
Age (A)		0.60			0.03			0.03			0.04	
Spacing (S)		NS			0.04			0.05			0.06	
A x S		NS			NS			NS			NS	

NS, Non-significant.

Table 2. Effect of age of bulbs and spacing on umbel, umblets formation, number of seeds umbel^{-1} and number of seeds plant^{-1} in kalazeera.

Spacing	Number of umbels plant^{-1}			Number of umblets umbel^{-1}			Number of seeds umbel^{-1}			Number of seeds plant^{-1}		
	3 year old	4 year old	Mean	3 year old	4 year old	Mean	3 year old	4 year old	Mean	3 year old	4 year old	Mean
15 × 10 cm	3.16	3.40	3.28	10.29	10.31	10.30	107	122	114.50	224	264	244
20 × 15 cm	4,89	5.19	5.19	10.51	10.52	10.52	142	149	145.50	520	576	548
20 × 20 cm	6.12	6.41	6.27	10.81	10.80	10.81	146	152	149.00	712	752	732
25 × 20 cm	7.54	7.77	7.66	11.21	11.25	11.23	147	154	150.50	920	976	948
30 × 25 cm	7.72	7.97	7.85	11.30	11.30	11.30	147	154	150.50	944	992	968
Mean	6.14	6.15		10.82	10.84		137.80	146.20		664	712	
$CD_{0.05}$												
Age (A)		0.08			NS			3.13			33.04	
Spacing (S)		0.10			0.10			NS			44.80	
A × S		NS			NS			NS			66.79	

NS, Non-significant.

plant^{-1} and number of branches plant^{-1} were significantly affected by the age of bulb. There was significant increase in these parameters with the increase in the age of bulbs. When the bulbs are in the initial stages of their life span, there are more chances of increase in bulb size and ultimately, increase in these parameters with the increase in age. All the yield attributes such as umbels plant^{-1}, number of seeds umbel^{-1}, number of umbelets umbel^{-1}, total number of seeds plant^{-1}, seed yield g plant^{-1}, seed yield g m^{-2} and total seed yield kg ha^{-1} increased significantly with the increase in bulb age. Panwar and Badiyala (1993) reported seed yield plant^{-1} increased with the age of bulb. The crop yield per unit area is a function of plant density and per plant yield. With increase in the number of plants per unit area, the crowding coefficient of plant community also increases which

Table 3. Effect of age of bulbs and spacing on seed yield g plant^{-1}, g m^{-2}, and kg ha^{-1} in kalazeera.

Spacing	Seed yield (g plant^{-1})			Seed yield (g m^{-2})			(Seed yield kg ha^{-1})		
	3 year old	4 year old	Mean	3 year old	4 year old	Mean	3 year old	4 year old	Mean
15×10 cm	0.28	0.33	0.31	18.67	22.03	20.35	186.7	220.3	203.50
20×15 cm	0.65	0.72	0.69	21.67	23.93	22.80	216.7	239.0	227.85
20×20 cm	0.89	0.94	0.92	22.33	23.53	22.93	223.3	235.3	229.30
25×20 cm	1.15	1.22	1.19	23.00	24.50	23.75	230.0	245.0	237.50
30×25 cm	1.18	1.24	1.21	15.70	16.51	16.11	157.0	165.0	161.00
Mean	0.83	0.89		20.274	22.1		202.74	220.92	
$CD_{0.05}$									
Age (A)		0.08			NS			3.13	
Spacing (S)		0.10			0.10			NS	
A × S		NS			NS			NS	

NS, Non-significant.

leads to decrease in freeness to the individual plant and increase in competition for growth factors from effective root zone. In this present investigation, the effect of plant spacing on the plant height was found non-significant. However, parameters like number of primary branches plant^{-1}, number of secondary branches plant^{-1} and number of tertiary branches plant^{-1} increased with the spacing of plants. Munshi and Baba (1990) also reported non-significant affect of plant spacing on plant height on saffron. Under optimum plant density, plants have efficient use of environmental conditions such as water, light and nutrient while under high plant density, there is competition among plants.

The age of bulbs showed significant effect on all yield attributes. The spacing 25 × 30 cm was found to get maximum seed yield (kg ha^{-1}). The spacing 25 × 20 cm produced 230 and 245 kg ha^{-1} for 3 year and 4 year old bulbs, respectively. However, Panwar et al. (1993) reported it to be 125 and 188 kg ha^{-1} for 3 and 4 years old bulbs, respectively. All the yield attributes increased significantly upto spacing of 25 × 20 cm, that is, density of 2 lakh plants ha^{-1}. However, various researchers had recommended different levels of plant density. Panwar (1990) reported that 160000 to 170000 plants ha^{-1} were considered to be optimum to get maximum seed yield with the spacing of 20 × 30 cm. However, Munshi et al. (1988) reported 250000 plants ha^{-1} as optimum to get maximum seed yield.

Conclusion

The results of this study showed that age of bulbs as well as spacing has significant effect on yield and yield attributes of Kalazera (*Bunium persicum*.Boiss). The spacing and 4 year old bulb + 20 × 25 cm spacing realized highest yield of 230 and 245 kg ha^{-1}, treatment combination of 3 year old bulb + 20 × 25 cm respectively. Thus this study concludes that for realizing optimum yields in kalazera the age of bulb and spacing must centre around 4 year + 20 × 25 cm, respectively. However, such study needs further testing under different agro-climatic locations of the valley to arrive at final conclusion.

REFERENCES

Chandel SRS (1984). A Handbook of Agricultural Statistics. Achal prakashan Mandir, Kanpur. p. 565.

Faravani M, Rahimian MH (1998). Determine the optimum plant population of black zira in nursery and filed Mashhad, Khorasan Agricultural Research Center. Annual Report.

Khosravi M (1993). Black zira (botanical, agricultural ecology, and study the possibility of production). Agronomy. Mashhad, College of Agriculture, Ferdowsi University of Mashhad. MSc thesis.

Khosravi M (2005). Intercropping Black Zira (*Bunium persicum*) with Saffron and annual crops: Agroecological and Economic Perspectives, Ph. D. Thesis.

Munshi AM, Baba GH (1990). Effect of planting density and depth of planting on the floral yield and corm multiplication in saffron under rainfed conditions of Kashmir. Indian Cocoa Arecanut. Spices. J. 14:160-162.

Munshi AM, Zargar GH, Baba GH, Bhat GN (1988). Effect of plant density and fertilizer levels on growth and seed yield of blackzeera under rainfed conditions. Indian Cocoa Arecanut Spices J. 13(4):134-136.

Panse VG, Sukhtame PV (1978). Statistical Methods for Agricultural Workers, ICAR, New Delhi. p. 610.

Panwar KS, Badiyala D (1993). Identification of some factors influencing grain yield in Kala zeera. Himachal J. Agric. Res. 16:44-47.

Panwar KS, Agarwal J, Sharma S (1993). Economic viability of Kala zeera cultivation in high altitude dry temperate regions of Himachal Pradesh. Agricultural Situation in India 48:151-154.

Pawar KS (1990). Kalazira ki Adhunic Kheti. Phal Phool, 13(3):7-9.

Sofi PA, Zeerak NA, Singh P (2009). Kala zeera (*Bunium persicum* Bioss.)." a Kashmirian high value crop. Turk. J. Biol. 33:249-258.