



# Manipulation of Plant Spacing and Steckling Size to Increase Growth and Seed Yield in Carrot (*Daucus Carota* L.) Under Temperate Conditions of Kashmir

Ashutosh Kumar\*, Baseerat Afroza, Nayeema Jabeen and Nighat Mushtaq

### Abstract

An experiment was conducted at Urban Technology Park, Division of Vegetable Science, SKUAST-Kashmir during 2013-2014. Four levels of spacing and four steckling sizes in carrot were used giving rise to sixteen treatment combinations. Widest spacing (60 cm x 75 cm) recorded maximum plant height number of branches plant<sup>-1</sup>, number of secondary umbels plant<sup>-1</sup>, number of tertiary umbels plant<sup>-1</sup>, seed yield per primary umbel, secondary umbel and tertiary umbel and seed yield plant<sup>-1</sup>. However highest seed yield, number of secondary and tertiary umbels were recorded in closest spacing of 60 cm x 30 cm. Extra-large steckling size (150-175 g) recorded highest plant height, number of branches plant<sup>-1</sup>, number of secondary and tertiary umbels, seed yield per primary, secondary and tertiary umbel, seed yield.

### Keywords

Carrot; Steckling size; Spacing; Seed production

### Introduction

Carrot is an important commercial crop of the temperate regions of the country especially Jammu and Kashmir. Congenial winter temperatures offer promise for quality seed production of carrot. The climate of Kashmir is ideal not only for production of carrot roots but also for seed production of this crop. But the major problem faced by the carrot growers is the unavailability of required quantity of good quality seed which necessitates standardization of production technology in respect of the seed crops to get a high yield of good quality seed.

Besides various factors, quality of seed produced is also affected by the size of roots used to prepare stecklings and planting distance followed. It is believed that large sized roots are capable of producing more quantity of better quality seed. It is a common practice among farmers to use large and extra-large sized roots for preparing the stecklings but no research has been conducted in this regard under Kashmir conditions. Hence there is a need to explore

the optimum size of the cut root for planting, which in turn will also save some percentage of the planting material that can be utilized for consumption purpose. Also the maintenance of adequate plant population per unit area is the most important factor that affects seed yield and quality. Hence, it becomes very important to find out the most suitable spacing in order to get higher seed productivity combined with quality. Keeping these facts under consideration, the present study was undertaken to standardize the steckling size and plant spacing for obtaining seed yield in carrot.

### Materials and Methods

The experiment was carried out during the year 2013-14 at Urban Technology Park, Division of Vegetable Science, Habbak, Srinagar. The experimental material consisted of stecklings graded into four classes with respect to their weights viz., Z<sub>1</sub> (Extra-large size with steckling weight of 150-175 g), Z<sub>2</sub> (Large size with steckling weight of 125-150 g), Z<sub>3</sub> (Medium size with steckling weight of 100-125 g) and Z<sub>4</sub> (Small size with steckling weight of 75-100 g). Each of the four grades of stecklings prepared as per their weights were transplanted at four different spacings viz., S<sub>1</sub> (60 cm x 30 cm), S<sub>2</sub> (60 cm x 45 cm), S<sub>3</sub> (60 cm x 60 cm) and S<sub>4</sub> (60 cm x 75 cm) (Table 1). The experiment was laid out in Randomised Complete Block Design with three replications with plots of 2.4 m x 1.2 m size. Recommended package of practices [1] were followed to raise a healthy crop. Observations were recorded on plant height, number of umbels per plant and seed yield.

### Results and Discussion

S<sub>4</sub> (60 cm x 75 cm) recorded the maximum plant height (170.90 cm), number of branches per plant (11.18), number of secondary umbels per plant (11.18), number of tertiary umbels per plant (19.98), highest seed yield per primary umbel (10.69 g), secondary umbel (7.77 g) and tertiary umbel (3.12 g) and seed yield per plant (73.40 g). These results indicate that the plant growth parameters and seed yield parameters are greatly influenced by plant spacing, wider spacing is more favourable. This might be due to the fact that wider spacing leads to availability of more space to grow and less competition for nutrients, light and air between the plants. Similar results have been reported by Anjum and Amjad [2] in carrot, Bilgili et al. [3] in forage turnip, Dev [4] in radish and Oliveira et al. [5] in fodder radish.

However maximum number of secondary umbels per square metre (42.62), number of tertiary umbels per square metre (65.65) and highest seed yield per plot (776.56 g) were recorded in spacing S<sub>1</sub> (60 cm x 30 cm). The results depicted that closest spacing produced highest seed yield. Since major contributions towards seed yield are by primary and secondary umbel orders, their number per unit area has increased in closer spacing due to adjustment of more number of plants. Similar results were obtained by Anjum and Amjad et al. [2] in carrot, [3] in forage turnip, Barbedo et al. [6] in carrot, Warade et al. [7] in radish, Bilekudari et al. [8] in radish, Kumar et al. [9] in radish, etc.

Z<sub>1</sub> (150-175 g) recorded the maximum plant height (168.75 cm), number of branches per plant (10.36), number of secondary umbels per plant (10.36), number of tertiary umbels per plant (17.53), number of secondary umbels per square metre (32.87), number of tertiary umbels per square metre (57.42), highest seed yield per primary

\*Corresponding author: Ashutosh Kumar, Department Of Horticulture, Bihar Agricultural University, Bhagalpur, Bihar, India, Tel: +919523037985; E-mail: ashooa4p@gmail.com

Received: January 18, 2017 Accepted: October 11, 2017 Published: October 16, 2017

Table 1: Effect of spacing and steckling size on growth and seed yield carrot seed crop cv. Early Nantes.

Treatments	Plant height (cm)	Number of branches per plant	Number of secondary umbels per plant	Number of tertiary umbels per plant	Number of secondary umbels per square metre	Number of tertiary umbels per square metre	Seed yield per primary umbel (g)	Seed yield per secondary umbel (g)	Seed yield per tertiary umbel (g)	Seed yield per plant (g)	Seed yield per square metre (g)
S1	161	8.8	8.8	15	42.62	65.65	9.04	5.67	1.59	60	332
S2	168	9.1	9.1	17	33.45	61.61	9.86	6.55	2.23	65	240
S3	170	10	10	18	27.65	52.13	10.39	6.91	2.75	69	193
S4	171	11	11	20	23.75	41.83	10.69	7.77	3.12	73	163
C.D.	1.88	0.7	0.7	0.7	1.96	1.82	0.26	0.22	0.13	0.9	3.8
Z1	169	10	10	18	32.87	57.42	10.58	6.98	2.67	69	238
Z2	169	9.8	9.8	17	32.18	55.82	10.15	6.82	2.49	67	234
Z3	166	9.6	9.6	17	31.38	54.4	9.83	6.63	2.34	66	229
Z4	166	9.4	9.4	17	31.03	53.59	9.83	6.46	2.19	65	226
C.D.	1.88	0.7	0.7	1.4	1.44	1.82	0.26	0.22	0.13	0.9	3.8

S<sub>1</sub> = 60 cm × 30 cm

Z<sub>1</sub> = Extra Large steckling size (150-175g)

S<sub>2</sub> = 60 cm × 45 cm

Z<sub>2</sub> = Large steckling size (125-150g)

S<sub>3</sub> = 60 cm × 60 cm

Z<sub>3</sub> = Medium steckling size (100-125g)

S<sub>4</sub> = 60 cm × 75 cm

Z<sub>4</sub> = Small steckling size (75-100g)

primary umbel (10.58 g), secondary umbel (6.98 g), tertiary umbel (2.67 g), seed yield per plant (68.80 g) and highest seed yield per plot i.e. 629.53 g.

The results depicted that seed yield increased with the increase in steckling size. The increase in seed yield depicted from the results might be due to difference in size of stecklings. Large steckling size has more accumulated food as compared to small steckling size which affects morphological characteristics of carrot like number of leaves, size of leaves, production of branches etc which ultimately leads to more seed yield. Similar findings were reported by Hamid et al. [10] in radish, Kumar et al. [8] in radish, Hemayati et al. [11] in sugar beet, Dev [12] in radish and Ilyas et al. [13] in carrot.

## References

- Anonymous, 2012. Vegetables- Package of practices (Manual). Vol. II. Directorate of Extension Education, SKUAST-Kashmir.
- Anjum MA, Amjad M (2002) Influence of mother root size and plant spacing on carrot seed production. *J Res Sci* 13: 105-112.
- Bilgili U, Sincik M, Uzan A, Acikgoz E (2003) The influence of row spacing and seeding rate on seed yield and yield components of forage turnip (*Brassica napus L.*). *J Agron Crop Sci*. 189: 250-254.
- Dev H (2010) Effect of root size on yield and quality of radish cv. White Icicle seed crop. *Asian J Hortic* 5: 281-283.
- Oliveira AS, Carvalho MLM, Nery MC, Oliveira JA, Guimares RM (2011) Seed quality and optimal spatial arrangement of fodder radish. *Scientia Agricola Piracicaba Braz* 68: 17-43.
- Barbedo ASC, Peixoto N, Camara FLA, Nakagawa J, Barbedo CJ (2004) Yield and quality of carrot seeds, cv. Brasilia, as a result of plant population, gibberellic acid and stage of maturity. *Seed Sci Technol* 32: 119-134.
- Warade AD, Gonge VS, Kulwal LV, Giri J (2004) Effect of time of planting and spacing on seed yield and quality of radish var. Pusa Chetki. *Agricu Sci Digest* 24: 21-23.
- Bilekudari MK, Deshpande VK, Shekhargouda M (2005) Effect of spacing and fertilizer levels on growth, seed yield and quality of radish. *Karnataka J Agric Sci* 18: 338-342.
- Kumar PR, Idnani LK, Yadav SK, Lal SK, Singh R (2007) Effect of steckling size on seed yield and quality of radish var. Japanese White under temperate climate. *Annual Agric Res New Series* 28: 60-62.

10. Hamid A, Shah ZA, Asif M (2002) Seed yield performance of radish depending on steckling size under the sub-tropical conditions of Azad Kashmir. *Asian J Plant Sci* 1: 636-637.

11. Hemayati SS, Taleghani DF, Shahmoradi S (2008) Effect of steckling weight and planting density on sugar beet (*Beta vulgaris L.*) monogerm seed yield and qualitative traits. *Pakistan J Biol Sci* 11: 226-231.

12. Dev H (2009) Effect of root size and quality of carrot seed cv. Early Nantes. *Haryana J Hortic Sci* 38: 119-121.

13. Ilyas M, Ayub G, Ahmad N, Ullah O, Hassan S. et al. (2013) Effect of different steckling size and phosphorus levels on seed production in carrot (*Daucus carota*). *Middle- East J Sci Res* 17: 280-286.

## Author Affiliations

Top

Department of Horticulture, Bihar Agricultural University, Bhagalpur, Bihar, India