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Economics of seed production in carrot as influenced by spacing, steckling size and umbel order

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Abstract

The present study was carried out at UTP, Habak, Division of Vegetable Science, SKUAST-Kashmir during 2013-14 to standardize the mother root size, spacing and umbel order to improve seed production in carrot for maximizing economic returns. The economics of different inputs and returns for carrot seed crop under different treatment combinations was worked out to find the most economical treatment combination. Maximum net returns of ₹ 1236812.76 ha⁻¹ were recorded with the use of small steckling size i.e. Z₄ (75-100 g) and closest spacing i.e. S₁ (60 cm × 30 cm) with benefit cost ratio of 5.26.

Keywords: Carrot, Seed production, Economics

Introduction

Carrot is among the top ten most economically important vegetable crops in the world in terms of area, production and market value (Fontes and Vilela, 2003) [3]. It is an important commercial crop of the temperate regions of our country especially Jammu and Kashmir where it is cultivated on an area of 1.35 thousand hectares with a total production of 33.33 thousand metric tonnes (Anonymous, 2013a) [1]. In Kashmir region only it is grown on an area of 800 hectares (Anonymous, 2013b) [2]. Congenial winter temperatures offer promise for quality seed production of carrot. But the major problem being 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 crop of carrot to get a high yield of good quality seed. 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. It also becomes very important to find out the most suitable spacing and the correct order of umbels to be utilized for extraction of seeds in order to get higher seed productivity combined with good quality that would ultimately result in higher economic gains. Keeping these facts under consideration, present study was taken up to standardize steckling size, spacing and umbel order for harnessing highest economic benefits in carrot seed production.

Materials and Methods

The present investigation was undertaken to standardize the mother root size, spacing and umbel order to improve quality and quantity of seed production in carrot for maximizing economic returns. The experiment was carried out at UTP, Habak, Division of Vegetable Science, SKUAST-Kashmir during 2013-14. Four sizes of stecklings viz. Z₁ (150-175 g), Z₂ (125-150 g), Z₃ (100-125 g) and Z₄ (75-100 g) were planted at four levels of spacing viz. S₁ (60 cm × 30 cm), S₂ (60 cm × 45 cm), S₃ (60 cm × 60 cm) and S₄ (60 cm × 75 cm). The experiment was laid out in Randomised Complete Block Design with three replications. The economics of different inputs and returns for carrot seed crop under different treatment combinations was worked out to find the most economical treatment combination. Gross returns were worked out by multiplying yield obtained with the average market price. The production cost was subtracted from the gross returns and the results obtained were taken as the net profit. The cost benefit ratio of each treatment was also worked out.

Results and Discussion

The details of cost of carrot cultivation per hectare, added cost and cost of cultivation are presented in Tables 1 and 2. The cultivation of carrot provided an employment to the tune of 190 labourers days per hectare from ploughing of land to harvesting of crop. Cost of cultivation was estimated in root yield (₹ 1, 27, 180.30 ha⁻¹).

The cost of cultivation and returns revealed the net returns of ₹ 2, 72, 819.70.

The details of cost of cultivation of carrot seed per hectare, treatment wise added cost and treatment wise cost of cultivation are presented in Tables 3 to 5. The seed production of carrot provided an employment to the tune of 250 labourers days per hectare from ploughing of land to harvesting, drying and related operations of crop. Maximum cost of cultivation (₹ 3, 18, 337.94 ha⁻¹) was estimated in S₁Z₁ (60 × 30 cm, Extra Large Steckling size, 150-175 g) seed production.

The treatment wise cost of cultivation and returns revealed that maximum net returns of ₹ 12, 36, 812.76 ha⁻¹ were

observed with the use of small steckling size i.e. Z₄ (Small steckling size, 75-100 g) and closest spacing i.e. S₁ (60 × 30 cm) followed by ₹11, 93, 257.16 ha⁻¹ observed in medium steckling size i.e. Z₃ (100-125 g) and closest spacing i.e. S₁ (60 × 30 cm) with benefit cost ratio of 5.26 and 4.54 respectively. The lowest net returns of ₹ 6,73,880.16 and 7,33,037.96 were registered in widest spacing i.e. S₄ (60 × 75 cm) with the use of Extra Large steckling size i.e. Z₁ (150-175 g) and in wider spacing i.e. S₃ (60 × 60 cm) with the use of Extra Large steckling size i.e. Z₁(150-175 g) with benefit cost ratio of 3.21.

Table 1: Cost of cultivation of carrot (ha⁻¹)

Cost involved on variable and fixed factors		₹ha ⁻¹
A	Preparatory tillage (Three ploughings at ₹ 3000.00 ha ⁻¹)	9000.00
	Clod breaking/leveling (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
	Preparation of beds/channels (40 labourer days at ₹ 150.00 labour ⁻¹)	6000.00
	Sowing of seed (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
Total A		21000.00
B.	Irrigation (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
C	Cultural operations (three hand weedings/hoeings 40 labourer days at ₹ 150.0 labour ⁻¹)	6000.00
D	Cost of fertilizer and manure application (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
E	Harvesting, and related operations (30 labourer days at ₹ 150.00 labour ⁻¹)	4500.00
Total (B+C+D+E+)		16500.00
Total (A+B+C+D+E+)		37500.00
Incidental charges at 5% of the working capital		1875.00
Total labour component involved in total cost of cultivation		39375.00
F	Cost of seed at 400 kg ⁻¹ for 5 kg seed ha ⁻¹	2000.00
	Cost of fertilizer	5698.10
	Cost of manure	60000.00
Total F		65698.10
Variable cost (labour + cost of seed+ cost of fertilizer and manure)		107073.10
Land rent at ₹ 900 kanal ⁻¹		18000.00
Land tax		80.0
Depreciation of implements		800.0
Total		18880.00
Interest at 6.5% on fixed factor		1227.2
Total fixed cost (18880+ 1227.2)		20107.2

Table 2: Economics of cost of cultivation of carrot (ha⁻¹)

Fixed cost (₹)	Variable cost (₹)	Total cost of cultivation (₹)	Carrot root yield (q)	Rate (₹)	Gross returns (₹)	Net returns (₹)
20107.2	107073.10	127180.30	200	20	400000	272819.70

Table 3: Cost of cultivation of seed production in carrot (ha⁻¹)

Cost involved on variable and fixed factors		₹ha ⁻¹
A	Preparatory tillage (Three ploughings at ₹ 3000.00 ha ⁻¹)	9000.00
	Clod breaking/leveling (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
	Preparation of beds/channels (40 labourer days at ₹ 150.0 labour ⁻¹)	6000.00
	Preparation of stecklings (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
	Transplanting of stecklings (40 labourer days at ₹ 150.0 labour ⁻¹)	6000.00
Total A		27000.00
B	Irrigation and drainage (20 labourer days at ₹ 150.00 labour ⁻¹)	3000.00
C	Cultural operations (three hand weedings/hoeings 40 labourer days at ₹ 150.00 labour ⁻¹)	6000.00
D	Application of Fertilizer and farm yard manure(20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
E	After care operations (20 labourer days at ₹ 150.0 labour ⁻¹)	3000.00
F	Harvesting of seed, curing, cleaning and related operations (30 labourer days at ₹ 150.0 labour ⁻¹)	4500.00
Total (B+C+D+E+F)		19500.00
Total (A+B+C+D+E+F)		46500.00
Incidental charges at 5% of the working capital		2325.00
Total labour component involved in total cost of cultivation		48825.00
G	Cost of fertilizer	7350.34
	Cost of manure	0000.00
Total G		67350.34
Variable cost (labour + cost of fertilizer+ cost of manure)		116175.34
Land rent at ₹ 900 kanal ⁻¹		18000.00

Land tax	80.00
Depreciation of implements	800.00
Total	18880.00
Interest at 6.5% on fixed factor	1227.2
Total fixed cost (18880.0 + 1227.2)	20107.2

Table 4: Treatment wise added cost of seed production of carrot cultivation (ha⁻¹)

Treatment details	Symbols	Returns for carrot root crop (₹)	Quantity of carrots utilized for steckling preparation (kg)	Cost of stecklings (₹20 kg ⁻¹)	Net returns (₹)	No. of labours involved @ ₹ 150 labour ⁻¹	Amount involved labourers (₹)	Total added cost (₹)
60cm × 30cm + 150-175g	S ₁ Z ₁	272819.70	9027.77	180555.40	92264.30	10	1500	182055.40
60cm × 30cm + 125-150g	S ₁ Z ₂	272819.70	7638.88	152777.60	120042.10	10	1500	154277.60
60cm × 30cm + 100-125g	S ₁ Z ₃	272819.70	6250.00	125000.00	147819.70	10	1500	126500.00
60cm × 30cm + 75-100g	S ₁ Z ₄	272819.70	4861.11	97222.20	175597.50	10	1500	98722.20
60cm × 45cm + 150-175g	S ₂ Z ₁	272819.70	6018.52	120370.40	152449.30	10	1500	121870.40
60cm × 45cm + 125-150g	S ₂ Z ₂	272819.70	5092.59	101851.80	170967.90	10	1500	103351.80
60cm × 45cm + 100-125g	S ₂ Z ₃	272819.70	4166.67	83333.40	189486.30	10	1500	84833.40
60cm × 45cm + 75-100g	S ₂ Z ₄	272819.70	3240.74	64814.80	208004.90	10	1500	66314.80
60cm × 60cm + 150-175g	S ₃ Z ₁	272819.70	4513.88	90277.60	182542.10	10	1500	91777.60
60cm × 60cm + 125-150g	S ₃ Z ₂	272819.70	3819.44	76388.80	196430.90	10	1500	77888.80
60cm × 60cm + 100-125g	S ₃ Z ₃	272819.70	3125.00	62500.00	210319.70	10	1500	64000.00
60cm × 60cm + 75-100g	S ₃ Z ₄	272819.70	2430.55	48611.00	224208.70	10	1500	50111.00
60cm × 75cm + 150-175g	S ₄ Z ₁	272819.70	3611.11	72222.20	200597.50	10	1500	73722.20
60cm × 75cm + 125-150g	S ₄ Z ₂	272819.70	3055.55	61111.00	211708.70	10	1500	62611.00
60cm × 75cm + 100-125g	S ₄ Z ₃	272819.70	2500.00	50000.00	222819.70	10	1500	51500.00
60cm × 75cm + 75-100g	S ₄ Z ₄	272819.70	1944.44	38888.80	233930.90	10	1500	40388.80

Table 5: Treatment wise comparative economics of cost of cultivation of seed production in carrot (ha⁻¹)

Treatment	Symbols	Fixed cost (₹)	Variable cost (₹)	Total added cost (₹)	Total variable cost (₹)	Total cost of cultivation (₹)	Seed yield (kg)	Returns from seed (₹)	Gross returns (₹)	Net returns (₹)	B:C Ratio (₹)
60cm × 30cm + 150-175g	S ₁ Z ₁	20107.2	116175.34	182055.40	298230.74	318337.94	3396.67	1358668.00	1450932.30	1132594.36	3.55
60cm × 30cm + 125-150g	S ₁ Z ₂	20107.2	116175.34	154277.60	270452.94	290560.14	3373.88	1349552.00	1469594.10	1179033.96	4.05
60cm × 30cm + 100-125g	S ₁ Z ₃	20107.2	116175.34	126500.00	242675.34	262782.54	3270.55	1308220.00	1456039.70	1193257.16	4.54
60cm × 30cm + 75-100g	S ₁ Z ₄	20107.2	116175.34	98722.20	214897.54	235004.74	3240.55	1296220.00	1471817.50	1236812.76	5.26
60cm × 45cm + 150-175g	S ₂ Z ₁	20107.2	116175.34	121870.40	238045.74	258152.94	2487.07	994828.00	1147277.30	889124.36	3.44
60cm × 45cm + 125-150g	S ₂ Z ₂	20107.2	116175.34	103351.80	219526.80	239634.00	2415.57	966228.00	1137195.90	897561.90	3.74
60cm × 45cm + 100-125g	S ₂ Z ₃	20107.2	116175.34	84833.40	201008.74	221115.94	2373.70	949480.00	1138966.30	917850.36	4.15
60cm × 45cm + 75-100g	S ₂ Z ₄	20107.2	116175.34	66314.80	182490.14	202597.34	2329.25	931700.00	1139704.90	937107.56	4.48
60cm × 60cm + 150-175g	S ₃ Z ₁	20107.2	116175.34	91777.60	207952.94	228060.14	1946.39	778556.00	961098.10	733037.96	3.21
60cm × 60cm + 125-150g	S ₃ Z ₂	20107.2	116175.34	77888.80	194063.80	214171.00	1936.94	774560.00	970990.90	756819.90	3.53
60cm × 60cm + 100-125g	S ₃ Z ₃	20107.2	116175.34	64000.00	180175.34	200282.54	1916.67	766668.00	976987.70	776705.16	3.88
60cm × 60cm + 75-100g	S ₃ Z ₄	20107.2	116175.34	50111.00	166286.34	186393.54	1905.55	762220.00	986428.70	800035.16	4.29
60cm × 75cm + 150-175g	S ₄ Z ₁	20107.2	116175.34	73722.20	189897.54	210004.74	1708.22	683288.00	883885.50	673880.76	3.21
60cm × 75cm + 125-150g	S ₄ Z ₂	20107.2	116175.34	62611.00	178786.34	198893.54	1631.11	652444.00	864152.70	665259.16	3.34
60cm × 75cm + 100-125g	S ₄ Z ₃	20107.2	116175.34	51500.00	167675.00	187782.20	1604.44	641776.00	864595.70	676813.50	3.60
60cm × 75cm + 75-100g	S ₄ Z ₄	20107.2	116175.34	40388.80	156564.14	176671.34	1580.67	632268.00	866198.90	689527.56	3.90

Cost of seed (TLC) - ₹400 kg⁻¹**Conclusion**

For carrot seed production, maximum net returns of ₹ 1236812.76 ha⁻¹ were recorded with the use of small steckling size i.e. Z₄ (75-100 g) and closest spacing i.e. S₁ (60 cm × 30 cm) with benefit cost ratio of 5.26.

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