ISSN: 2347-4688, Vol. 5, No.(3) 2017, Pg. 288- 291

Current Agriculture Research Journal

www.agriculturejournal.org

Growth and Seed Yield of Asalio (*Lepidium Sativum* L.) as Influenced by Seed Rates and Sowing Methods

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Abstract

The experiments were carried out during Rabi season for the three consecutive years of (2012 to 2014) at the Research Farm, College of Horticulture, Mandsaur (M.P.) under AICRP on M&AP, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). The treatments consisted of two sowing methods as M1- seed broad casting and M_2- line sowing. Five seed rate S_1- 6, S_2-8, S_3- 10, S_4-12 and S_5-15 kg/ha. These treatments were evaluated in Factorial Randomized Block Design with three replications. Significantly maximum plant height was recorded under treatment S_5, maximum number of number of branches was recorded under treatment S_2, maximum stem girth was recorded under treatment S_2 and seed yield was recorded under treatment S_2.

Article History

Received: 11 July 2017
Accepted: 2 November 2017

Keywords:

Asalio, Lepidium, seed rate and sowing metho

Introduction

Asalio is a polymorphous species, also known popularly as Garden cress and is believed to have originated primarily in the high land region of Ethiopia and Eritrea. Garden cress (*Lepidium sativum* L.) is an erect annual edible herb belonging to the family Cruciferae. In India, it is grown mainly in Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh and Maharashtra in an area of about 5000 hectare[1]. Apart from India, it is also cultivated in North America and parts of Europe[2].

Analysis of Garden cress seed has the following nutrient and phytochemical values moisture (5.69%), protein (23.5%), fat (15.91%), ash (5.7%), phosphorus (P_2O_5) (1.65%), calcium (0.31%) and sulphur (0.9%). The seeds contain alkaloid (0.19%), glucotropaeolin, sinapin (choline ester of sinapic acid), sinapic acid (4 hydroxy-3:5-dimethoxycinnamic acid, $C_{11}H_{12}O_5$, m.p. 192 °C), mucilaginous matter (5%) and uric acid (0.108 g/kg). On steam distillation, it yields a volatile oil similar to that from the herb. The oil has pronounced estrogen activity, test on immature rats receiving 3 to 4 drops of the oil with the diet consistently show better development and higher weights of the ovaries than control animals and exhibited several hemorrhagic of follicles in the ovaries[3].

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To Link to this Article: http://dx.doi.org/10.12944/CARJ.5.3.04

The seed mucilage is known as cress seed mucilage, which is used as a substitute for Arabica gum. The seeds are used for increasing milk yield in animals and human beings. They are beneficial in promoting digestion and growth in children. Seed oil is externally used in rheumatism. The extracts of seed have hypotensive effect with transient respiratory stimulation. They are boiled with milk and are used to induce abortion[4]. Fresh leaves and young seedlings are mainly used as spice and are rich source of glucosinolates[5] and also used as salads. Roots are bitter, acrid and are useful in treatment of secondary syphilis.

Due to its diversified uses, demand and popularity, cultivation of garden cress is increasing on a commercial scale.

Material and Methods

The experiments were carried out during Rabi season of 2011-12 to 2013-14 at the Research Farm, College of Horticulture, Mandsaur (M.P.) under All India Coordinated Research Project on Medicinal and Aromatic Plants, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). Geographically Mandsaur is situated in Western part of Madhya Pradesh between latitude of 23 °45 ' to 24 °13' N and longitude of 74 °44' to 75 °18' E at an altitude of 435.2 Meter above Mean Sea Level (MSL). This region falls under Malwa Plateau (10th agro climatic zone of the state) and enjoys the sub-tropical and semi arid climate with the maximum temperature of about 43- 45°C in summer and minimum temperature 5 °C in winter. The annual rainfall is 544.05 mm most of which is from 20th June to end of September. Dry spell is a common feature due to uneven distribution of rainfall. The soil of experimental field was medium black clay in texture with uniform topography. The treatments consisted of the two sowing method M_1- seed broad casting and M_2- line sowing. Five seed rate S_1- 6, S_2-8, S_3-10, S_4-12 and S5-15 kg/ha. These treatments were sown in Factorial Randomized Block Design with three replications and three years data analyzed statistically. Observations were recorded under investigation i.e. plant height, number of branches, stem girth and seed yield. Three years data are depicted in table 1. All the above mentioned observations were recorded from five plants were randomly selected from each treatment for determining various growth and yield parameters. The plant height was measured from ground level

Table 1: Effect of seed rates and sowing methods on the growth parameters and seed yield of Asalio.

Treatments	Plant height (cm plant^{-1})				No. of branches (plant^{-1})				Stem girth (mm plant^{-1})				Seed yield (q ha^{-1})			
	Year				Year				Year				Year			
	2012	2013	2014	Mean	2012	2013	2014	Mean	2012	2013	2014	Mean	2012	2013	2014	Mean
Seed Rates (kg ha^{-1})																
S_1-6	76.5	76.5	72.5	75.17	18.6	17	15.5	17.03	9.4	8.25	7.9	8.52	20	19	18.2	19.07
S_2-8	82.5	81	77	80.17	19.5	18	16.5	18	9.4	8.6	8.1	8.7	20.8	20	19.5	20.1
S_3-10	98.5	88.5	83.5	90.17	13.5	13	11.5	12.67	6	5.75	5.2	5.65	14	14	13	13.67
S_4-12	112.5	98	92	100.83	11	11	9.5	10.5	5.4	5.1	5	5.17	13.2	12	11.7	12.3
S_5-15	119	112.5	105	112.17	10	9	7.5	8.83	4.8	5.15	4.3	4.75	12	11.3	11	11.43
SEm±	7.05	3.27	2.21	-	1.59	0.99	0.62	-	0.52	0.6	0.32	-	1.55	1.11	0.78	-
CD at 5%	14.1	6.87	4.66	-	4.53	2.1	1.31	-	1.5	1.26	0.68	-	4.52	2.33	1.64	-
Sowing Methods																
M_1	97.2	89.4	83.8	90.13	15.2	14.6	12.6	14.13	7.5	6.74	6.2	6.81	16.6	16.3	15.58	16.16
M_2	98.5	93.2	88.2	93.3	13.8	12.6	11.6	12.67	6.5	6.4	5.8	6.23	15.4	14.2	13.8	14.47
SEm±	4.45	2.06	1.4	-	1	0.63	0.39	-	0.33	0.38	0.2	-	0.98	0.7	0.5	-
CD at 5%	9.37	4.34	NS	-	2.98	1.32	NS	-	0.91	0.79	NS	-	2.72	1.47	NS	-

M_1-Seed Broad casting and M_2-Line Sowing

to the tip of the main branch. The height of the plant was recorded at the time of maturity. Primary branches were recorded by counting the number of branches arising from the main central stem of plant at the time of maturity. Stem girth was measured by digital vernier caliper from individual plant at maturity. Seed yield was recorded by weighing the clean seed of harvested siliqua from individual sample and converted in q/ha.

Results and Discussion

Yield and yield attributes were significantly influenced by seed rate and sowing methods. The seed rates were more effective than sowing method of L. *sativum*. On the basis of three years mean data (Table 1), it was observed that the plant height found to be significant. The highest (112.17 cm) plant height was recorded in S_5, followed by S_4 (100.83 cm), S_3 (90.17 cm) and S_2 (80.17 cm) and lowest in S_1 (75.17 cm) as affected due to seed rate. The effect of methods of sowing and interaction were found to be non significant. This might be due to the competition of solar energy coupled with shallow root system. Increased plant density limits the availability of space for lateral growth resulting in increased plant height and hence root configuration affecting the crop growth. These findings were in agreement with[6] in radish,[7] in cauliflower and[8] in Chinese cabbage.

Number of branches per plant significantly increased with seed rates however, the maximum (18.00) number of branches were recorded in S_2, followed by S_1 (17.00), S_3 (12.67) and S_4 (10.50) while lowest in S_5 (8.83). The results of methods of sowing and interaction were found to be non significant, which can be attributed to fact that, in wider spacing or lower plant density the individual plant get plenty of light and more nutrients in comparison to higher plant density. The results of present study were also confirmed by the findings of[9] in cauliflower and[10] in cabbage. This was due to smaller space among plants in broadcast resulting in higher competition for nutrients; while in row sowing there was wider space and thus relatively less plant competition for nutrients[11]. Also,[12] reported taller and more branched plants at the lower plant densities of Sesame. The variability among treatments for primary branches may be due to availability of moisture and nutrients. Closely spaced plants might have faced competition for resources.[13] Observed few branches per plant grown at highest densities. Thus, our findings are in line with them.

Seed rates were significantly influenced stem girth as compared to sowing methods. The highest stem girth was recorded in S_2 (8.70 mm) followed by S_1 (8.52 mm), S_3 (5.65 mm) and S_4 (5.17 mm) and were lowest in S_5 (4.70 mm). Under sowing methods, the stem girth was higher (6.74 mm.) in line sowing method over broad costing. This increase in plant growth and yield may be attributed to optimum thermal environment, consequent to increased dry matter production, higher dry matter accumulation, higher leaf area index and higher translocation of food material for the formation of seed during October month, thus influencing better response in *Lepidium sativum*[14].

The seed yield was significantly differing among the treatments. However, the highest seed yield was recorded in S_2 (20.10 q/ha) followed by S_1 (19.07), S_3 (13.67) and S_4 (12.30) and it was lowest in S_5 (11.43 q/ha) due to seed rate. Under the sowing methods, the highest seed yield was recorded in M_1 (16.3). The interaction were found to be non significant. The beneficial effect of less seed rate in seed yield has been due to better light penetration and higher photosynthetic efficiency resulting in development of plant canopy with more number of pods/plant and seed/plant[15]. The second important factor is to provide non-competitive space between the plants as higher plant density adversely affect the growth and development and on the other hand, higher yield per plant obtained under wider spacing may not compensate the yield at optimum plant population[15].

Conclusion

Lepidium sativum L. is an erect annual edible herb and polymorphous species is belonging to the family Cruciferae. From the above investigation it could be concluded that 8 kg seed rate with broad costing has shown better performance amongst all others seed rate and sowing methods. However, this combination has significantly influenced the number of branches, stem girth and seed yield except plant height.

Acknowledgment

The authors wish to thanks to AICRP on Medicinal and Aromatic Plants, ICAR, New Delhi for financial

support as well as providing laboratory facility at the division during course of this investigation. This manuscript is a part of research programme under AICRP on Medicinal and Aromatic Plants.

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