Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 5341-5345

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 5341-5345**
Journal homepage: http://www.ijcmas.com

Original Research Article

Effect of Nitrogen and Plant Growth Regulators on Yield and Quality of Ajwain (*Trachyspermum ammi* L. Sprague)

Sheeshpal Choudhary*, A. C. Shivran, Babu Lal and Rajveer Singh

Department of Agronomy, Sri Karan Narendra College of Agriculture, Sri Karan Narendra Agricultural University, Jobner, Rajasthan-303 329, India
**Corresponding author*

A B S T R A C T

A field experiment was conducted at Agronomy farm, S.K.N. College of Agriculture, Jobner in Jaipur district of Rajasthan during *rabi* season of 2016-17 on loamy sand soil. The experiment consisted of four levels of nitrogen (0, 30, 60 and 90 kg/ha) and five PGRs (control, NAA @ 50 ppm at 40 DAS, NAA @ 50 ppm at 40 and 60 DAS, thiourea @ 500 ppm at 40 DAS and thiourea @ 500 ppm at 40 and 60 DAS). The total 20 treatment combinations were tested in factorial randomized block design with three replications. The results showed that application of nitrogen up to 30 kg/ha recorded significantly improved the protein content (18.0%) and essential oil content in seed (2.84%) over control, application of nitrogen up to 60 kg/ha recorded significantly higher yield *viz.*, seed (1081 kg/ha), straw (3012 kg/ha) and biological yields (4093 kg/ha) of ajwain over preceding levels but remained at par with 90 kg N/ha. The results further revealed that application of PGRs significantly increased protein content and essential oil content in seed of ajwain over control, however all PGRs remained at par to each other, foliar application of thiourea @ 500 ppm spray at 40 and 60 DAS significantly increased seed (1112 kg/ha), straw (3082 kg/ha) and biological yields (4195 kg/ha) over thiourea @ 500 ppm spray at 40 DAS, NAA @ 50 ppm spray at 40 DAS and control but remained at par with NAA @ 50 ppm spray at 40 and 60 DAS in yield attributes and yields.

Keywords

Ajwain, Nitrogen, PGRs, Quality and Yield

Introduction

The ajwain (*Trachyspermum ammi* L., 2n =18) belonging to the family Apiaceae (Umbelliferae) is an important seed spice. The ajwain is Indigenous to India and Egypt (Sayre, 2001). Ajwain is a cross-pollinated, aromatic and annual herbaceous plant. The flowers are protandrous and cross-pollination occurs through insects. The seed contain 3 to 4% volatile oil depending on the genotype or botanical type. Besides volatile oil, the seeds contain about 8.9% moisture, 15.4% protein, 18.1% fat, 38.6% carbohydrate, 11.9% crude fiber and 7.1% minerals. The important minerals are calcium, phosphorus, iron, sodium and potassium. While major vitamins found are thiamine, riboflavin, nicotinic acid and carotene (Pruthi, 2001).

In India, during the year 2015-16, area under the ajwain crop is 24010 ha and production is 17180 tonnes (Anonymous, 2015-16a). In Rajasthan it is cultivated in the districts of Chittorgarh, Udaipur, Rajsamand, Bhilwara, Kota and Jhalawar covering an area of 11058 ha with production and productivity

of 4672 tonnes and 401 kg/ha, respectively (Anonymous, 2015-16b).

Materials and Methods

The experiment was conducted on plot No. A-3 at Agronomy farm, S.K.N. College of Agriculture, Jobner (Rajasthan). Geographically, Jobner is situated 45 km away from Jaipur in western side at 26^0 05' North latitude, 75^0 20' East longitude and at an altitude of 427 metres above mean sea level in Jaipur district of Rajasthan. The region falls under agro-climatic zone-IIIa (Semi-arid eastern plain zone). The soil of the experimental field was loamy sand in texture with low in organic carbon (0.14%), low in available nitrogen (130.0 kg/ha), medium in available phosphorus (18.9 kg/ha) and potassium (175.6 kg/ha) and slightly alkaline in reaction with pH 8.2.

Results and Discussion

Effect of nitrogen

A perusal of data (Table 1) indicated that application of nitrogen upto 30 kg/ha recorded significantly increased protein content and essential oil content in seed by 14.72 and 8.8 per cent and thus proved significantly superior to control. However, further increase in nitrogen dose responded slightly with non-significant difference. The protein content and essential oil content in seed is essentially a manifestation of its content, higher nitrogen concentration in seed due to nitrogen application @ 30 kg/ha resulted in significantly higher protein content and essential oil content. These findings corroborate the results of Naruka *et al.,* (2012) in ajwain and Patel *et al.,* (2013) in coriander.

Application of 60 kg N/ha was found significantly superior over 30 kg N/ha and control giving 10.8 and 28.3 per cent higher seed yield, 2.67 and 5.92 q/ha higher straw yield and 3.73 and 8.31 q/ha higher biological yield, respectively (Table 2). This might be associated with the corresponding increased the number of umbels per plant, number of seeds per umbel and test weight, biological yield is the sum of seed and straw yields, the improvement in the parameters as discussed above enhanced the biological yield significantly due to nitrogen fertilization.

Results of the present investigation corroborate the results of Nath *et al.,* (2008), Naruka *et al.,* (2012) and Muvel *et al.,* (2015) in ajwain and Patel *et al.,* (2013) in coriander.

Effect of plant growth regulators

A perusal of data (Table 1) indicated that application of PGRs significantly increased protein content and essential oil content in seed of ajwain over control, however all PGRs remained at par to each other. The per cent increase with thiourea @ 500 ppm spray at 40 and 60 DAS, NAA @ 50 ppm spray at 40 and 60 DAS, thiourea @ 500 ppm spray at 40 DAS and NAA @ 50 ppm spray at 40 DAS were 21.9, 20.7, 17.1, 13.9 and 20.9, 20.1, 13.4 and 12.2 over control, respectively.

Foliar spray of NAA @ 50 ppm spray at 40 and 60 DAS significantly increased protein and essential oil content in seed of ajwain over control. This increase in protein content might be the outcome of increased concentration of nitrogen in seed of ajwain by foliar spray of NAA which promotes protein synthesis. These results are in accordance with the work of Meena (2005) in coriander, Bairwa and Kaushik (2010) in fenugreek and Rohamare *et al.,* (2013) in ajwain.

Table.1 Effect of nitrogen and plant growth regulators on protein and Essential oil content in seed

Treatment	Protein content (%)	Essential oil content (%)
Nitrogen level (kg/ha)		
0	15.69	2.61
30	18.00	2.84
60	19.06	3.01
90	19.25	3.07
SEm±	0.44	0.07
CD (P=0.05)	1.25	0.21
Plant growth regulators		
Control	15.69	2.54
NAA @ 50 ppm spray at 40 DAS	17.88	2.85
NAA @ 50 ppm spray at 40 and 60 DAS	18.94	3.05
Thiourea @ 500 ppm spray at 40 DAS	18.38	2.88
Thiourea @ 500 ppm spray at 40 and 60 DAS	19.13	3.07
SEm±	0.49	0.08
CD (P=0.05)	1.39	0.23

Table.2 Effect of nitrogen and plant growth regulators on seed, straw and Biological yields and harvest index

Treatment	Yield (kg/ha)			Harvest index (%)
	Seed	Straw	Biological	
Nitrogen level (kg/ha)				
0	842	2420	3262	25.79
30	975	2745	3720	26.18
60	1081	3012	4093	26.38
90	1111	3112	4223	26.28
SEm±	25	69	94	0.64
CD (P=0.05)	70	197	269	NS
Plant growth regulators				
Control	846	2457	3304	25.60
NAA @ 50 ppm spray at 40 DAS	975	2759	3734	26.10
NAA @ 50 ppm spray at 40 and 60 DAS	1084	3036	4120	26.30
Thiourea @ 500 ppm spray at 40 DAS	992	2778	3771	26.30
Thiourea @ 500 ppm spray at 40 and 60 DAS	1112	3082	4195	26.50
SEm±	27	77	105	0.72
CD (P=0.05)	79	220	300	NS

Foliar application of PGRs significantly increased seed yield, straw yield and biological yield of ajwain over control (Table 2). Significantly higher seed yield 12.0, 14.0 and 31.4 per cent, straw yield 10.9, 11.7 and 25.4 per cent and biological yield 11.2, 12.3 and 29.9 per cent with application of thiourea @ 500 ppm spray at 40 and 60 DAS over thiourea @ 500 ppm spray at 40 DAS, NAA @ 50 ppm spray at 40 DAS and control, respectively, however, it remained at par with application of NAA @ 50 ppm spray at 40 and 60 DAS.

The increase in yield attributes and yields obtained with thiourea application was most probably due to increased crop photosynthesis favoured by both improved photosynthetic efficiency and source to sink relationship. Thiourea with its sulphydryl group not only favoured the green photosynthetic surface but might have also improved the activity of starch synthetase and hence, the effective filling of seeds. Similar response with foliar spray of thiourea was also recorded by Gupta and Yadav (2009).

The foliar application of NAA @ 50 ppm two sprays at 40 and 60 DAS, significantly increased number of umbels per plant, number of seeds per umbel, test weight, seed, straw and biological yields over NAA @ 50 ppm one spray at 40 DAS and control. It might be due to stimulating effect of NAA which induced large number of reproductive sinks which led to greater activity of carboxylating enzymes (ribose 1,5-disphosphate carboxylase) resulting in higher photosynthetic rate with greater translocation and accumulation of metabolites in the sinks and ultimately the higher seed yield. These results corroborate the findings of Bairwa and Kaushik (2010) and Gour *et al.,* (2010) in fenugreek and Singh *et al.,* (2012) in coriander.

References

Anonymous, 2015-16a. Vital Agricultural Statistics. Published by Spices Board India, Ministry of Commerce & Industry, *Government of India*.

Anonymous, 2015-16b. Vital Agriculture Statistics. Directorate of Agriculture, *Pant Krishi Bhawan*, Jaipur (Rajasthan).

Bairwa, R.C. and Kaushik, M.K. 2010. Response of fenugreek (*Trigonella foenum-graecum* L.) varieties to fertility levels and growth regulators on productivity, profitability and quality. *Journal of Progressive Agriculture* 1(1): 65-67.

Gour, K., Patel, B.S. and Mehta, R.S. 2010. Growth, yield and profitability of fenugreek (*Trigonella foenum-graecum* L.) as influenced by varying levels of growth regulators and vermin-wash. *Journal of Spices and Aromatic Crops* 19(1&2): 65-67.

Gupta, D.K. and Yadav, S.S. 2009. Response of fenugreek (*Trigonella foenum-graecum*) to varying levels of sulphur and bio-regulators. Published by S.K.N. College of Agriculture in National Seminar on "*Spices and Aromatic Plants in 21st Century India",* pp. 67.

Meena, S.S. 2005. Studies on effect of sowing dates, nitrogen and plant growth regulators on growth, yield and quality of coriander (*Coriandrum sativum* L.) cv. RCr.-41. M.Sc. (Ag.) *Thesis*. Maharana Pratap University of Agriculture and Technology, Udaipur, India.

Muvel, R., Naruka, I.S., Chundawat, R.S., Shaktawat, R.P.S., Rathore, S.S. and Verma, R. 2015. Production, productivity and quality of ajwain (*Trachyspermum ammi* L. Sprague) as affected by plant geometry and

fertilizer levels *International Journal Seed Spices* 5(2): 32-37.

Naruka, I.S., Singh, P.P., Megha Barde and S.S. Rathore 2012. Effect of spacing and nitrogen level on growth, yield and quality of ajwain (*Trachyspermum ammi* L. Sprague). *International Journal Seed Spices* 2(1): 12-17.

Nath, P., Jaiswal, R.C., Verma, R.B. and Yadav, G.C. 2008. Effect of date of sowing, nitrogen levels and spacing on growth and yield of ajwain (*Trachyspermum ammi* L. Sprague). *Journal of Spices and Aromatic crops* 17(1): 1-4.

Patel, C.B., Amin, A.U., and Patel, A.L. 2013. Effect of varying levels of nitrogen and sulphur on growth and yield of coriander (*Coriandrum sativum* L.). *The Bioscan* 8(4): 1285-1289.

Pruthi, J.S. 2001. Minor spices and condiments, Crop management and post-harvest technology. Published by publication and Information Division, ICAR, Krishi Anusandhan Bhavan, Pusa, New Delhi-110012, pp. 124-133.

Rohamare, Y., Nikam, T.D. and Dhumal K.N. 2013. Effect of foliar application of plant growth regulators on growth, yield and essential oil components of Ajwain (*Trachyspermum ammi* L.). *International Journal Seed Spices* 3(2): 34-41.

Sayre, J.K. 2001. Ancient herbs and modern herbs. Bottlebrush Press, San Carlos, California, USA, pp 14.

Singh, D., Singh, P.P., Naruka, I.S., Rathore, S.S. and Shektawat, R.P.S. 2012. Effect of plant growth regulators on growth and yield of coriander (*Coriandrum sativum L.*). *Indian Journal of Horticulture* 69(1): 91-93.