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Effect of thiourea on yield and nutrient uptake of coriander (*Coriandrum sativum* L.) varieties under normal and late sown conditions

L R Balai & G L Keshwa

Department of Agronomy, S K N College of Agriculture
Rajasthan Agricultural University
Jobner–303 329, Rajasthan, India.
E-mail: lalaramtonk@gmail.com

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Abstract

A field experiment was conducted on loamy sand soil at Jobner (Rajasthan) during *rabi* season to study the effect of thiourea on yield and nutrient uptake of coriander (*Coriandrum sativum*) varieties under normal and late sown conditions. The crop sown at normal sowing time (last week of October) produced significantly higher seed yield (14.2 qha^{-1}), straw yield (23.9 qha^{-1}) and total uptake (14.2 $kgha^{-1}$) of phosphorus (P) as compared to late sown crop. The concentration of nitrogen (N) and potassium (K) in seed and straw were significantly higher under late sown condition over normal sowing. The variety RCr-435 gave higher seed and straw yield, N and K concentrations in seed and straw and total uptake of N, P and K as compared to RCr-41. Application of thiourea (1000 ppm) at vegetative and flowering stages significantly increased the seed (24.6%) and straw yields (25.8%), N (25.6% and 27.3%) and K (25.2% and 26.0%) concentrations in seed and straw and total uptake of N, P and K as compared to water sprayed control.

Keyword: coriander, *Coriandrum sativum*, nutrient uptake, yield, thiourea.

In north India especially in Rajasthan, the temperature starts rising by February onwards, coinciding with late flowering and grain filling stage coupled with soil moisture stress which leads to low productivity of coriander (*Coriandrum sativum* L.) in the region. Use of thiourea has been reported to improve dry matter partitioning and subsequently enhance the productivity of crops and mitigate the problem of late sowing to some extent (Sahu & Singh 1995). Application of thiourea especially under late sown condition may enhance photosynthetic efficiency with greater translocation and partitioning of metabolites towards reproductive sink, which ultimately leads to greater seed yield (Yadav 2005). The coriander varieties RCr-435 and RCr-41 are suitable for normal conditions and are also cultivated in a large area in Rajasthan. The productivity of the crop has stagnated due to prevailing management practices. Therefore, it was felt necessary to evaluate the use of thiourea on these two varieties and its effect on yield under normal and late sown conditions.

The field experiment was conducted during *rabi* season of 2003-04 and 2004-05 at

Agronomy Farm, SKN College of Agriculture, Jobner (Rajasthan) on loamy sand soil having pH-8.31, ECe-1.25 dSm^{-1}, organic Carbon-0.28% and available nitrogen (N), phosphorus (P) and potassium (K)-148, 15.18 and 159.9 kg ha^{-1}, respectively. The rainfall of the region varies between 400-500 mm, most of which is received during July to September. The experiment consisted of two sowing dates (normal and late sown i.e., last week of October and second week of November), two varieties (RCr-41 and RCr-435) and seven thiourea treatments namely, water spray (control), seed soaking (1 min dip in solution) with thiourea 500 ppm (0.05%), seed soaking with thiourea 1000 ppm (0.1%), foliar spray of thiourea 500 ppm at vegetative stage, foliar spray of thiourea 500 ppm at vegetative and flowering stages, foliar spray of thiourea 1000 ppm at vegetative stage and foliar spray of thiourea 1000 ppm at vegetative and flowering stages. These 28 treatment combinations were replicated thrice in a split plot design, keeping dates of sowing and varieties in main plots and thiourea treatments in sub-plots. Seed and straw yields were recorded. N, P and K concentrations in seed and straw were determined by colorimetric method, using Nessler's reagent to develop colour (Snell & Snell 1949), 'vanadomolydo phosphoric acid' yellow colour method (Jackson 1973) and flame photometry method (Bhargava & Raghupati 1993), respectively.

Effect of sowing time

There was significant increase in seed and straw yields and total uptake of P in the normal crop than late sowing crop during both the years and pooled mean (Table 1). This might be due to favourable environmental conditions available to the crop during its initial growth, flowering and fruiting stages. The possible reason for low yield in delayed sowing might be due to insufficient time for vegetative growth as the plant entered the reproductive phase at a faster rate. The increase in P uptake could be ascribed due to higher production of total biomass. Thus significant improvement in seed and straw yields by virtue of higher photosynthesis under normal sown crop ultimately resulted in higher uptake of P. It was observed that delayed sowing increased the N and K concentrations in seed and straw. This might be explained on the basis of dilution effect due to higher yield under normal sowing time. These results are in conformity with the findings of Baswana *et al*. (1989), Bhati (1991), Maurya (1990) and Khoja & Gupta (2004) in coriander.

Effect of varieties

The coriander variety RCr-435 recorded significantly higher seed and straw yields, N and K concentrations in seed and straw, and total uptake of N, P and K over RCr-41 during both years and on pooled mean basis probably due to its genetic nature. Results of a field experiment conducted at Jobner, indicated that the variety RCr-435 recorded significantly higher yield attributes and seed yield as compared to RCr-41 and local (AICRPS 1998).

Effect of thiourea

Application of thiourea 1000 ppm at vegetative and flowering stages significantly increased seed and straw yields, N and K concentrations in seed and straw and total uptake of N, P and K, as compared to water sprayed control during both the years and on pooled mean basis. The favourable effect of thiourea on growth of plants might be due to improved photosynthetic efficiency. Application of thiourea also creates lighter microbial population in soil which is responsible for mobilizing essential nutrients.

The interactive effect of thiourea and sowing dates was significant on seed yield (Table 2). Foliar application of different thiourea treatments significantly improved the seed yield at individual sowing date over control. Foliar spray of thiourea 1000 ppm twice at vegetative and flowering stages at normal sowing date (TU_6D_1) represented an increase of 16.9% yield over water sprayed control under same sowing date (TU_0D_1) as against 35.9% by TU_6D_2 (two foliar sprays of 1000

Table 1. Effect of dates of sowing, varieties and thiourea on yield and nutrient content and uptake of coriander (pooled mean of two years)

Treatment	Seed yield (q ha^{-1})	Straw yield (q ha^{-1})	N content (%)		Total N uptake (kg ha^{-1})	P content (%)		Total P uptake (kg ha^{-1})	K content (%)		Total K uptake (kg ha^{-1})
			Seed	Straw		Seed	Straw		Seed	Straw	
Dates of sowing											
Normal	13.8	22.3	2.60	0.840	54.9	0.552	0.239	13.0	0.859	0.487	22.9
Late	12.0	20.8	2.87	0.888	53.5	0.558	0.251	12.0	0.938	0.565	23.3
SEm±	0.12	0.20	0.04	0.009	0.77	0.008	0.003	0.17	0.012	0.007	0.32
CD (P=0.05)	0.38	0.60	0.12	0.027	NS	NS	NS	0.51	0.036	0.023	NS
Varieties											
RCr-41	12.2	20.8	2.66	0.848	50.3	0.549	0.242	11.8	0.831	0.497	20.5
RCr-435	13.6	22.2	2.81	0.880	58.1	0.561	0.248	13.2	0.965	0.556	25.6
SEm±	0.12	0.20	0.04	0.009	0.77	0.008	0.003	0.17	0.012	0.007	0.32
CD (P=0.05)	0.38	0.60	0.12	0.027	2.37	NS	NS	0.51	0.036	0.023	0.99
Thiourea											
Water spray (control)	11.4	19.0	2.42	0.762	42.0	0.538	0.236	10.6	0.788	0.462	17.7
Seed soaking 500 ppm	12.2	20.1	2.54	0.806	47.1	0.545	0.240	11.5	0.842	0.489	20.1
Seed soaking 1000 ppm	12.6	20.5	2.61	0.823	49.6	0.550	0.241	11.9	0.870	0.507	21.3
Spraying 500 ppm at V	13.0	21.7	2.73	0.863	54.2	0.556	0.246	12.6	0.906	0.531	23.3
Spraying 500 ppm at V + F	13.4	22.8	2.86	0.902	59.0	0.562	0.249	13.2	0.943	0.553	25.2
Spraying 1000 ppm at V	13.6	22.8	2.93	0.925	60.8	0.564	0.251	13.4	0.956	0.562	25.8
Spraying 1000 ppm at V + F	14.2	23.9	3.04	0.970	66.7	0.571	0.253	14.2	0.987	0.582	28.0
SEm±	0.15	0.25	0.05	0.010	1.20	0.010	0.005	0.20	0.013	0.008	0.46
CD (P=0.05)	0.41	0.71	0.14	0.027	3.37	NS	NS	0.61	0.036	0.023	1.29

V=Vegetative stage; F=Flowering stage

Table 2. Combined effect of thiourea and sowing dates on seed yield (q ha^{-1}) (pooled data of two years)

Treatment	TU_0	TU_1	TU_2	TU_3	TU_4	TU_5	TU_6
D_1	12.4	13.4	13.7	14.2	14.5	14.0	14.5
D_2	10.3	11.1	11.4	11.9	12.4	13.1	14.0
				SEm±	CD (P=0.05)		
TU at same level of D				0.21	0.58		
D at same or different level of TU				0.44	1.24		

D_1 = Normal sown, D_2 = Late sown, TU_0 = Water spray (control), TU_1 = Seed soaking in 500 ppm, TU_2 = Seed soaking in 1000 ppm, TU_3 = Spray of 500 ppm at vegetative stage, TU_4 = Spray of 500 ppm at vegetative + flowering stages, TU_5 = Spray of 1000 ppm at vegetative stage, TU_6 = Spray of 1000 ppm at vegetative + flowering stages

ppm at vegetative and flowering at late sowing) over water sprayed control under late sowing (TU_6D_2). The magnitude of increase in seed yield was more under late sown condition as compared to normal sowing due to foliar spray of thiourea.

The study indicated that coriander variety RCr-435 at normal sowing time (last week of October) coupled with foliar spray of thiourea 1000 ppm at vegetative and flowering stages gave significantly higher seed yield and the magnitude of increase in yield was higher in late sown condition than normal sowing.

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