

Original Research Article

<https://doi.org/10.20546/ijcmas.2017.603.289>

Response of Lentil to Thiourea Application under Rain Fed Conditions of Central India

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ABSTRACT

Present study was conducted to evaluate the effect of thiourea application on the productivity of lentil in rain fed conditions of central India. The lentil crop was grown with different magnitudes of the thiourea. The results of the study revealed that, the applications of thiourea @ 500 ppm followed by thiourea @ 1000 ppm at pre flowering and pod initiation stages were significantly improved the growth and yield of lentil. The plant height (42.95 cm) under the treatment with thiourea @ 500 ppm followed by thiourea @ 1000ppm at pre flowering and pod initiation was observed significantly higher among the all other treatments. Similar trends were noted with respect to the total number of pods per plant (163), number of seeds per pod (1.5) and test weight (2.38 g). The biological yield and grain yield were also found significantly higher in the treatment receiving thiourea @ 500ppm followed by thiourea @ 1000ppm. The total biomass yield (3652 kg/ha) and grain yield (1279 kg/ha) were found highest in the treatment where thiourea applied @ 500 at pre flowering and pod initiation stages. An increase of 20% in the grain yield of lentil was noted with the application of thiourea @ 500ppm at pre flowering and pod initiation stage as compared to control treatment. In conclusion, the lentil crop responds positively to the application of the thiourea with enhancement in the agronomical performance and productivity.

Keywords

Lentil, Pre flowering, Potential, Rainfed condition, Thiourea, Yield.

Article Info

Accepted:

20 February 2017

Available Online:

10 March 2017

Introduction

Lentil is the most widely cultivated pulse crop grown under rainfed conditions in Madhya Pradesh. The less availability of the water affects the growth and productivity of the crop. The plant growth regulators *viz.* thiourea known to tolerate the deficiency of moisture (Asthir *et al.*, 2013). Plant growth regulators like sulphahydril is well known to enhance the source sink relationship and stimulate the translocation of photo-assimilates thereby

helping in effective flower initiation, fruit and seed development and ultimately enhance productivity of the crops. Growth regulator can improve the physiological efficiency of crop including photosynthetic ability and can enhance the effective partitioning of accumulates from source and sink in the field crops (Solamani *et al.*, 2001). Thiourea is the most important of which include exogenous application of stress alleviating agents.

Thiourea is a sulphahydral compound and help to improve productivity and its role as a drought tolerant is well established under the arid and semi-arid regions (Sahu *et al.*, 1993).Thiourea have 42% sulphur and 36 % of nitrogen. Thus, it behaves in physiology of plants both as a sulphahydril compound and as an amino compound like urea (Garg *et al.*, 2006). The stimulatory action of thiourea in various physiological processes of plant. It is mainly used for its dormancy breaking and germination stimulating effect. Several researchers working on many crops had reported that the use of growth substances is one of the effective means of delaying the senescence of leaves. The beneficial effects of thiourea were attributed to its role in significantly increasing the net photosynthetic rates and the concentrations of total chlorophyll and starch in the leaves (Burman *et al.*, 2004). The present study was conducted to evaluate the response of lentil crop to the application of the thiourea in rainfed conditions in central India.

Materials and Methods

The present investigation was conducted at the RAK College of agriculture, Sehore (RVSKVV) for three consecutive years, 2012- 2014. Lentil cv. JL-30 was grown under rain fed conditions. The experimental soil was a clayey with 7.1% clay, 5.6% silt, 63.1% fine sand and 24.0% coarse sand contains 0.28% organic carbon and 0.023% total nitrogen. The soil have 80 kg available N, 12 kg available P and 120 kg available K. The moisture content of the experimental soil was 10.0% at field capacity (w/w) and 3.0% at permanent wilting point (15 bars), respectively. Lentil was sown in field plots on second fortnight of November. Thirteen treatments were laid out in randomized block design with four replications each. The treatment involving plant growth regulators viz. T1 - Control (no spray), T2 - Water spray

at pre flowering, T3- Water spray at pod initiation, T4- Water spray at pre flowering + pod initiation, T5- Urea 2% spray at pre flowering, T6- Urea 2% spray pod initiation, T7- Urea 2% spray at pre flowering + pod initiation, T8- Thiourea 500 PPM at pre flowering, T9- Thiourea 500 PPM at pod initiation, T10 Thiourea 500 PPM at pre flowering + pod initiation, T11- Thiourea 1000 PPM at pre flowering, T12- Thiourea 1000 PPM at pod initiation, T13- Thiourea 1000 PPM at pre flowering + pod initiation. For analyzing the growth patterns of the crop viz., plant height and number of branches were recorded on five randomly selected plants in a plot of each treatment at different stages viz., 30 DAS, 60 DAS and maturity. The observations on yield parameters like number of pods per plant, number of seeds per pod, seed yield per plant and seed yield per hectare were recorded as per the standard procedures.

Results and Discussion

Growth attributes

The number of branches per plant is an important morphological character, directly related to yield in lentil. The foliar application of thiourea @ 500ppm at pre flowering and pod initiation stages significantly affect plant height. The maximum plant height (42.95 cm) and branches per plant (5.20) were recorded with application of thiourea @ 500ppm followed by of thiourea @ 1000ppm at pre flowering and pod initiation stages over water spray and control (Table 1). The maximum plant height and branches were attained under the treatment because thiourea increased the net photosynthetic rates and the concentrations of total chlorophyll and starch in the leaves. Thiourea has also been reported to significantly improve growth, yield and water use efficiency of mungbean, Yadav (2005). Thiourea induced increase in seed

yield due to better translocation of photosynthates has also been reported earlier (Sahu and Solanki (1991), Parihar *et al.* (1998), Sharma *et al.* (2015)).

Table.1 Effect of water and thiourea spray on growth and yield of lentil

Treatments	Plant height	Branches	Pods/plant	Test weight	Seeds /pod	Biomass yield kg/ha	Grain yield kg/ha	Harvest index %
T ₁	35.58	3.77	65.77	1.88	1.70	2374	795	33.54
T ₂	37.54	3.47	83.73	1.90	1.73	2243	758	33.71
T ₃	36.06	3.83	74.83	1.87	1.77	2585	869	33.78
T ₄	36.74	3.93	91.40	1.94	1.90	2861	972	34.01
T ₅	38.51	4.73	96.83	2.06	1.97	3220	1089	33.78
T ₆	38.39	3.93	91.67	2.10	2.10	3158	1070	33.90
T ₇	37.55	4.50	102.17	2.24	1.63	3519	1173	33.53
T ₈	38.63	4.17	120.23	1.98	1.90	3274	1121	34.06
T ₉	41.78	4.70	113.40	2.17	2.10	3325	1114	33.54
T ₁₀	42.95	5.20	163.17	2.38	1.50	3652	1279	34.92
T ₁₁	42.00	4.47	121.20	1.91	1.80	3269	1098	33.54
T ₁₂	40.45	4.37	105.77	2.10	1.70	3147	1062	33.63
T ₁₃	40.05	4.03	113.27	2.05	1.60	3228	1083	33.78
SEm	1.71	0.25	13.99	0.14	0.11	240	78	0.75
SEd	2.42	0.35	19.79	0.19	0.16	339	111	1.07
CD 5 %	4.97	0.72	40.68	0.40	0.32	697	228	2.19

Yield attributes and yield

Yield attributing parameters like pods per plant, seeds per pod and test weight are directly related to plant yield. The maximum pods per plant (163.17), seeds per pod (1.50) and test weight 2.38g were recorded in treatment applying thiourea @ 500ppm at pre flowering and pod initiation stages over water spray and control treatment. The effect of

thiourea on growth characters might be attributed due to stress mitigation effect and promote crop growth. These results were conformity with Anjum *et al.* (2008) and Bhunia *et al.* (2015).

Total biomass production 3652 kg/ha and grain yield 1279kg/ha were recorded with the application of thiourea @ 500 ppm at pre flowering and pod initiation followed by the

thiourea @ 1000 ppm at pre flowering. The improved yield through thiourea might be due to the increased photosynthesis and efficient transport of photosynthates towards the sink which ultimately leads to greater seed yield. The increase in the yield recorded in this investigation could be a reflection of the effect of thiourea on growth and development. The yield was higher due to increased in the number of branches per plant pods and hence more seeds, increase in the photosynthetic, which could lead to increase in photosynthesis, resulting in greater transfer of assimilates to the seeds and causing increase in their weight. These results are conformity with Mehta *et al.* (2002), Anitha *et al.* (2004), Anitha *et al.* (2006), Meena and sharma (2010). The harvest index of lentil was not affected by the application of thiourea at any stage. Harvest index was increased due to spraying the plants with the application of thiourea @ 500 ppm pre flowering and pod initiation as compared to control.

In conclusion the results of experiment indicated that the spray of thiourea @ 500ppm at pre flowering and pod initiation stages followed by the application of thiourea @ 1000ppm at pre flowering and pod initiation significantly improved the growth and the yield of lentil. The positive effects of thiourea seems to be mediated through enhanced photosynthetic efficiency besides more efficient carbohydrate and nitrogen metabolism and translocation of photophynthets to different part of the plant.

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How to cite this article:

Singh, R.P. and Dasharath Singh. 2017. Response of Lentil to Thiourea Application under Rain Fed Conditions of Central India. *Int.J.Curr.Microbiol.App.Sci*. 6(3): 2556-2560.
doi: <https://doi.org/10.20546/ijcmas.2017.603.289>