

-Short Communication

FOLIAR APPLICATION OF DI-AMMONIUM PHOSPHATE AND TRIPLE SUPER PHOSPHATE ON LENTIL AT DROUGHT PRONE AREA OF BANGLADESH

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ABSTRACT

A field experiment was conducted to investigate the effect of foliar application of DAP and TSP on yield and yield attributing characters of lentil. Foliar application of DAP and TSP was performed at flowering and pod formation stages of lentil. Results revealed that maximum fresh weight of plant, nodule number and dry weight of nodule were recorded in F₂ treatment at 50% flowering stage of lentil. F₁ treatment produced higher branch plant⁻¹ (2.66), pod plant⁻¹ (106.47) and seed yield (0.72 t ha⁻¹) of lentil. DAP increased 6% higher grain yield than no foliar application of fertilizer. It may be suggested that foliar application of DAP is a better technology for increasing lentil production in drought prone area of Bangladesh.

Key words: Drought area, Foliar spray, DAP, TSP, Lentil, Yield

Maintaining food and nutritional security for the increasing population of the world is a great challenge for us (Lobell and Burke 2010). Besides emphasizing main crops and vegetables, various pulses play an important role to satisfy the growing human food demands. Among the food crops, pulses are important source of protein and it provides nutritional security. Generally lentil is grown as a post-rainy season crop in the rain-fed areas of Bangladesh. Rain fed reduces crop yield due to lack of nutrients movement by water from soil to plants. Under rain fed condition, drought is a serious problem at flowering and pod formation stages of crops because insufficient soil water can hamper pollination and sink of different compounds to

grain from other parts of plant. In many places of developing countries like Bangladesh, water stress is the major constraint to agricultural production that impairs the quality, growth and production of crops (Ahmad *et al.* 2015). Under this circumstance foliar application of fertilizer would be more efficient and economical than the soil application (Rajesh and Paulpandi 2013). On the other hand, foliar application is regarded as a preferred solution when quick supply of nutrients is hindered or the soil conditions are not conducive for the absorption of nutrients (Salisbury and Ross 1985). Keeping the above points in view the foliar spraying of DAP and TSP was evaluated for their effect on lentil production in drought area of Bangladesh.

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Field experiment was conducted during rabi season of 2017-18 at Bangladesh Institute of Nuclear Agriculture (BINA) Substation, Chapai Nawabganj, Bangladesh. The experimental field was well prepared and laid out in a randomized block design with three replications. Treatment combinations were F_0 = control (no foliar application of DAP and TSP), F_1 = foliar application of DAP and F_2 = foliar application of TSP. The soil was a silty loam having pH 7.20, organic carbon 1.20%, total N 0.105%, available P 3.75ppm, available S 20.17ppm and exchangeable K 0.105 % meq. Binamasur 5 was used as the test crop. The plot size was (4m × 3m) 12m². The fertilizer applied was 20, 40, 40 kg N, P₂O₅, K₂O per ha as basal in the form of

were randomly selected at harvest stage for collecting data on plant height, number of branch plant⁻¹, number of pods per plant⁻¹ and number of effective pod plant⁻¹. Collected data were analyzed statistically following the one way ANOVA technique with the help of MSTAT-C software (Gomez and Gomez 1984). The mean differences among the treatments were adjusted by DMRT.

Results showed that foliar application of DAP and TSP did not show any significant effect on plant height, fresh weight of plant and dry weight of nodule at 50% flowering stage of lentil (Table 1). Maximum plant height (28.87cm) was found in F_1 treatment. The highest fresh

Table 1. Effects of foliar application of fertilizers on yield attributing characters of lentil

Treatment	50% flowering stage				Harvest stage				
	Plant height (cm)	Fresh wt./plant (gm)	Nodule no./plant	Dry wt. of nodule /plant	Plant height (cm)	Branch/plant (no.)	Pod/plant (no.)	Effective pod/plant (no.)	Hay yield (t ha ⁻¹)
F_0	27.73	6.47	2.33b	12.33	30.92a	2.62	102.93	86.73	1.62
F_1	28.87	7.73	2.00b	10.33	27.80b	2.66	106.47	96.27	1.60
F_2	27.73	7.80	4.50a	13.00	28.00b	2.63	103.13	98.73	1.60
CV(%)	6.42	21.07	17.90	30.65	1.73	6.68	6.60	6.61	10.23
Sig. level	NS	NS	*	NS	*	NS	NS	NS	NS

In a column, figures having similar letters do not differ significantly as per DMRT. *Significant at 1% level, NS-Non-significant.

urea, single super phosphate and muriate of potash. All the fertilizers were applied before sowing of lentil seed. Three per cent (3%) DAP (di-ammonium phosphate) and 2% TSP (triple super phosphate) were applied at flowering and pod formation stages of lentil. Hand weeding was done twice at 20 and 40 days after sowing. Normal cultural practices were adopted to raise a good crop. Five plant samples from each plot

weight (7.80g), nodule number (4.50) and dry weight of nodule (13g) per plant were recorded in F_2 treatment at 50% flowering stage of lentil.

At harvest stage, the highest plant height (30.92cm) was found in control (F_0) treatment but the important yield contributing characters of lentil like number branches plant⁻¹ and number of pods plant⁻¹ were higher in F_1 and F_2

treatments. Maximum number of branches plant⁻¹ was observed in F₁ treatment. Ram and Punia (2007) have also recorded higher number of branches plant⁻¹ with foliar application of urea in lentil. The maximum number of pods per plant was observed when DAP was supplied to plants through foliage while minimum number of pods per plant was noted in the plants with no foliage fertilizer application. Both the treatments (F₁ and F₂) significantly increased number of pods plant⁻¹ over the control. The maximum number of effective pod per plant was also recorded with treatment F₁ and F₂ which were significantly higher over the control. This might be due to quick and more availability of nitrogen and phosphorus from DAP to the leaves for maximum photosynthesis process. Foliar application of DAP produced more grains per pod in green gram (Raman 2006, Nigmananda and Elamathi 2007). Ram and Punia (2007) reported similar results of foliar application of urea for increasing the number of grains pod⁻¹ in lentil. Results indicated that foliar application of DAP and TSP significantly increased grain yield of lentil (Fig. 1). Maximum grain yield was

initiation stages. Good interaction and compatibility between nitrogen and phosphorus in DAP helped to better utilization and intake of nitrogen and phosphorus to the crop plant, which ultimately resulted in higher grain yield than other treatments. Foliar application of DAP increased 6% grain yield over control treatment. Increase in yield and yield attributes might be due to fulfillment of the demand of the crop by higher assimilation and translocation of photosynthates from source to sink through adequate supply of nutrients by foliar application of fertilizers (Kuttimani and Velayutham 2011). The highest hay yield was obtained from F₀ treatment. Same hay yield (1.60 t ha⁻¹) was found in F₁ and F₂ treatments. From these results it may be suggested that foliar application of DAP can increase grain yield of lentil at drought prone area of Bangladesh. Plant height (r²=0.798), branch number (r+=0.923), pod number (r²=0.792) and effective pod number (r²=0.566) showed significant positive correlation with grain yield of lentil. On the other hand, hay yield (r²=0.750) showed significant negative correlation with grain yield

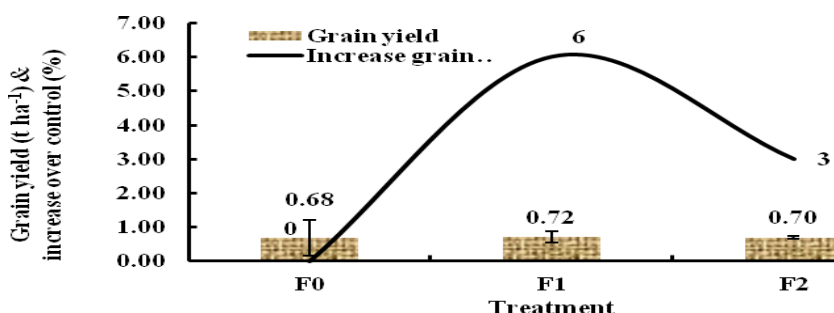


Fig. 1. Effects of foliar nutrition on grain yield of lentil

found in F₁ treatment.

when it was applied once at flowering stage and other at pod initiation stage. TSP fertilizer has also responded significantly better when it was applied at flowering stage and other at pod

of lentil.

From the regression studies it was clear that foliar application of TSP and DAP recorded significant effect on growth, pod formation and pod filling of lentil. (Table 2)

Table 2. Correlation regression between yield and yield contributing characters of lentil

Parameters	Regression line	Correlation co-efficient (R ² value)
Plant height Vs grain yield	$y = -0.0102x + 0.9957$	0.798**
Branch number Vs grain yield	$y = 0.9231x - 1.7338$	0.923**
Pod number Vs grain yield	$y = 0.009x - 0.2326$	0.792**
Effective pod Vs grain yield	$y = 0.0024x - 0.477$	0.566*
Hay yield Vs grain yield	$y = -1.5x + 3.11$	0.750**

Foliar spray of DAP (3%) increased 6% grain yield of lentil over control treatment. In drought prone areas, foliar spray of DAP (3%) treatment at flowering and pod formation stages was the most effective in terms of improving growth and yield of lentil in water stress environment where nutrient uptake is greatly limited.

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