

NITROGEN FERTILIZER MANAGEMENT FOR POLE BEAN IN THE UPCOUNTRY INTERMEDIATE ZONE

J.D.H. WIJewardena¹ AND U.W.S.P. YAPA
Regional Agricultural Research and Development Center
Bandarawela

Nitrogen is one of the most important nutrients required for crop production. However, nitrogen is continually lost from soil through plant removal and other processes such as leaching, denitrification and ammonia volatilization (Russell, 1980). The problem faced by the farmers everywhere is that the capacity of their soil to supply N declines rapidly once agricultural activities commence. Therefore, N derived from the breakdown of soil organic matter must be supplemented from other sources (Peoples *et al.*, 1994).

Fertilizers are convenient and readily available sources of plant nutrients for crop growth. Fertilizers provide opportunities for strategic and rapid application of plant nutrients. Hence, there has been a substantial increase in the use of fertilizers in the recent past. In this context, urea is the major form of N fertilizer used in many parts of the world. For a developing country like Sri Lanka which imports all its

fertilizer requirements, an increase in the world market prices of fertilizers causes heavy drain on foreign exchange reserves. Therefore, it is essential to use imported fertilizers wisely. The correct dosage and the right time of application are the two important aspects of nitrogen fertilizer management for any crop.

In the up country, vegetable cultivation is intensive and highly commercialized. Consequently, unlike the general pattern of low fertilizer use in the other parts of the island, most farmers in up country use more than recommended quantities of chemical and organic fertilizers (Wijewardena, 1996).

Pole bean is an important vegetable in the up country intermediate zone. Generally, farmers of this region apply higher quantities of urea than the DOA recommendation in several split applications to pole bean. This practice results in high cost of production and also contributes to environmental pollution.

¹ Present address : RARDC, Bombuwela

However, there is hardly any reported experimental evidence on the effects of different practices of urea application to pole bean in this region. A field experiment was therefore conducted to investigate the use of urea as a source of N in different applications to develop a suitable nitrogen fertilizer practice for pole bean.

MATERIALS AND METHODS

A field experiment was conducted over 03 consecutive seasons at the Regional Agricultural Research and Development Center, Bandarawela. The following treatments were included in this trial.

1. No N
2. N in 02 splits (Basal and 3 weeks after planting)
3. N in 03 splits (Basal, 3 and 6 weeks after planting)
4. N in 04 splits (Basal, 3, 6 and 9 weeks after planting)
5. N in 02 splits (3 and 6 weeks after planting)
6. N in six splits (Basal, 3 weeks after planting and subsequent 4 splits after each harvest)

The 6th treatment was the farmers' practice in the up country intermediate zone. The

experiment was laid out in a randomized complete block design and replicated four times. The experiment was started in *yala* '94 and continued in *maha* 94/95 and *yala* '95. Pole bean variety SER was used in this experiment.

The plot size was 3.2 m x 2.5 m. The amount of nitrogen applied was 100 kg/ha as recommended by the DOA except for treatment 01 (No N) and treatment 06 (Farmers' practice). The treatment No. 6 received 300 kg N/ha that is the average amount of N applied by the farmers in the up country. Nitrogen was applied as urea. Constant levels of P at the rate of 125 kg P₂O₅/ha and K at the rate of 90 kg K₂O/ha were added to all the treatments. Phosphorus and potassium were applied as triple super phosphate and muriate of potash, respectively.

The crop was grown under rainfed conditions with supplementary irrigation whenever necessary during all seasons. Experimental plots were maintained weed free throughout the trial period.

RESULTS AND DISCUSSION

The results of the experiment are presented in Table 1.

Table 1: The effects of different time of N fertilizer application on pole bean yield (t/ha).

Treatment	Yield (t/ha)		
	yala '94	maha 94/95	yala '95
No N	8.8	6.6	5.7
N in 02 splits (basal and 3 WAP*)	16.6	19.4	9.4
N in 03 splits (basal, 3 & 6 WAP)	17.0	17.8	7.5
N in 04 splits (basal, 3, 6 & 9 WAP)	15.7	15.5	8.9
N in 02 splits (3 & 6 WAP)	12.7	17.4	6.7
N in 6 splits (basal, 3 WAP & four splits after each harvest)	13.2	12.8	6.9
LSD (P=0.05)	3.2	2.9	1.2
CV(%)	15.6	12.8	10.2

* WAP - Weeks after planting.

The results of this study indicate that nitrogen fertilizer application increased pole bean yield over the control (Table 1). This result shows the importance of N fertilizer application to bean crop grown in this region. Because of the low N fixation by the bean crop (Fageria, *et al.*, 1989), bean utilizes appreciable amount of fertilizer nitrogen. Therefore, application of N is an important aspect of nutrient management for bean crop to increase the yield.

Results further revealed that the highest yield of pole bean was obtained with 02 splits of N as basal and 3 weeks after planting at the rate of 100 kg N/

ha (DOA recommendation). The yield brought about by 06 splits of N at higher rates as practiced by farmers is very much lower than the yield given by the DOA recommendation.

This study further demonstrated that N fertilizers should be applied at the correct growth stage as shown in this study at basal and 3 weeks later. This finding highlights the greater need for nitrogen and the capacity to utilize N by bean plants during the early stages of growth. The N fertilizer management practices of the farmers in the up country of adding higher rate of N fertilizer

(300 kg/ha) after each harvest is not beneficial. Further, excess N application could increase the vegetative growth of leguminous plants (Sangakkara, 1989). This practice also increases the production cost of pole bean. Therefore, findings of this study confirm that DOA recommended times and rates of N fertilizer application are suitable for pole bean cultivation for the up country intermediate zone.

CONCLUSION

Application of nitrogen fertilizer at the rate of 100 kg/ha leads to the highest yield in pole bean. High rates of nitrogen fertilizer application practiced by farmers did not result in higher yields of pole bean. In addition, DOA recommended time of N fertilizer application at basal and 3 weeks after planting is the most suitable for pole bean in up country.

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