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Economics and Quality of Soybean as Influenced by Integrated Nutrient Management and *In-situ* Moisture Conservation Practices

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Abstract: *An Agronomic investigation "Effect of integrated nutrient management and insitu moisture conservation practices on economics and quality of soybean" was carried out at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during Kharif season of 2013. The split plot design was used which consisted of nine treatment combinations comprising of three treatments of integrated nutrient management with three treatments of moisture conservation practices replicated three times. The crop was sown by hand dibbling method with recommended spacing of 45cm x 5cm. The application of rhizobium + recommended dose of fertilizer + FYM @ 5t ha^{-1} significantly highest seed yield, straw yield, biological yield, gross monetary returns and net monetary returns over nutrient treatment of recommended dose of fertilizer alone and rhizobium + FYM @ 5t ha^{-1} alone. Opening of furrow in each row is the most suitable and adaptive measure in soybean which produced seed yield, straw yield, biological yield, gross monetary returns and net monetary returns over opening of furrow in fourth row and flat bed. The interaction effect between integrated nutrient management and insitu moisture conservation practices did not influenced the growth, yield, quality and economics of soybean.*

Keywords: *Rhizobium, FYM, soybean, insitu soil moisture conservation, flat bed, furrow planting in soybean.*

INTRODUCTION

In India, Soybean is grown on an area of 10.69 million ha with production of 12.67 millions tones and average productivity of 1185 kg ha^{-1} (Anonymous, 2012). Now a days, there is a vast scope for soybean production due to high nutritional quality, more production, short duration (90-110 days), tolerate long dry spell and being leguminous crop helps in improving the fertility and productivity of soil. Hence, it is known as "Gold of soil" (Saste, 2011).

A sustainable increase in production can be obtained by using fertilizers. More scientific efforts are needed to increase the productivity of soybean per unit area and per unit time with optimum fertilizer dose. Therefore it is necessary to study the behavior of soybean under various fertilizer levels (Garud, 2013). Application of organic manures alone sustain the fertility of soil but are unable to fulfill increasing demand of growing population, whereas application of mineral fertilizers alone help to get higher yields but they cannot sustain the fertility of soil on a long term basis. Also the fertilizer use efficiency is low in all mineral fertilizer and organic manures when used separately or alone. So to overcome all these constraints organic and inorganic fertilizer level combination is used in the experimental treatment with the other treatments.

Efficient rainwater management is crucial to rainfed agriculture. Its success depends on how best rainwater is conserved and utilized. In shallow alfisol crop growing period is seriously affected due to scanty and erratic distribution of rainfall. Proper mechanical and vegetative structure can help to conserve the rainwater *insitu* and provide the essential moisture for crop growth. In this view, an attempt was made to study the degree of different beneficial effect of integrated nutrient management and *insitu* moisture conservation practices on Economics and quality of soybean.

MATERIALS AND METHODS

A field experiment was conducted during *kharif,* season of 2013 at Department of Agronomy, College of Agriculture, Vasantrao Naik Marathwada Krishi

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Table 1
Economics of soybean as influenced by various treatments

Treatment	*Gross monetary returns (Rs ha^{-1})*	*Net monetary returns (Rs ha^{-1})*	*B:C ratio*
Integrated nutrient management (3)			
N_1 : Rhizobium + FYM @ 5t ha^{-1}	52483	29687	2.28
N_2 : Recommended dose of fertilizer	56470	36503	2.82
N_3 : Rhizobium + RDF + FYM @ 5t ha^{-1}	69624	44527	2.77
S.E$_m$ ±	508.63	508.63	–
C.D. at 5 %	1565.21	1565.21	–
Moisture conservation techniques (3)			
M_1 : Flat bed	53523	31669	2.42
M_2 : Opening of furrow in each row	67821	44467	2.92
M_3 : Opening of furrow in fourth row	57233	34580	2.52
S.E$_m$ ±	434.77	434.77	–
C.D. at 5%	1337.93	1337.93	–
Interaction (N × M)			
S.E$_m$ ±	753.04	753.04	–
C.D. at 5%	NS	NS	–
General mean	59526	36905	2.62

Vidyapeeth, Parbhani. The soil of experimental plot was clayey in texture and slightly alkaline in reaction . The soil of the experimental plot was low in available nitrogen (207.31 kg ha^{-1}), medium in available phosphorus (14.55 kg ha^{-1}), very high in available potassium (451.60 kg ha^{-1}) and low in organic carbon content (0.48 %).

A field experiment was laid out in split plot design which consisted of nine treatment combinations comprising of three treatments of integrated nutrient management practices with three treatments of *insitu* moisture conservation practices replicated three times. The three integrated nutrient management consisted of rhizobium + FYM @ 5t ha^{-1} (N_1), recommended dose of fertilizer (N_2) and rhizobium + recommended dose of fertilizer + FYM @ 5t ha^{-1} (N_3) as main plot treatments with three *insitu* moisture conservation practices *i.e.* flat bed (M_1), opening of furrow in each row (M_2) and opening of furrow in fourth row (M_3) as sub plot treatments were included in the investigation. Soybean variety MAUS-71 was sown by hand dibbling method at the spacing of 45 cm × 05 cm. Rhizobium seed treatment was done @ 250 g per 10 kg seed before sowing and the soybean crop was fertilized at the time of sowing with recommended dose of fertilizer (RDF) applied @ 30:60:30 NPK kg ha^{-1} by using fertilizers diammonium phosphate (DAP), urea and muriate of potash (MOP). A well decomposed farm yard manure is used as per the requirement of treatment at the rate of 5 tonnes ha^{-1}.

RESULTS AND DISCUSSION

Effect of Integrated Nutrient Management on Economics of Soybean:

Application of rhizobium + RDF + FYM @ 5t ha^{-1} (N_3) recorded significantly highest gross and net monetary returns than recommended dose of fertilizer (N_2) and rhizobium + FYM @ 5t ha^{-1} (N_1). This might be due to the high cost of FYM as well as its high quantity needed per hectare application. But the application of FYM improves the soil physical condition and also maintains the fertility of soil. Besides that the combine application of organic and inorganic fertilizers increased the seed yield ultimately turn to higher net monetary returns. Similar results were obtained by Joshi and Billore (2004) and Ramesh *et al.* (2009). However, application of RDF alone gave the highest B:C ratio.

Effect of Integrated Nutrient Management on Quality of Soybean

Among the integrated nutrient management practices used, rhizobium + RDF + FYM @ 5t ha^{-1} (N_3) recorded numerically the highest oil content (20.54 %).

Effect of Moisture Conservation Practices on Economics of Soybean

Insitu moisture conservation practices had profound effect on gross and net monetary returns. Opening of furrow in each row (M_2) recorded significantly higher gross and net monetary than opening of furrow in fourth row (M_3) and flat bed (M_1). This

might be due to the conservation of moisture in treatments opening of furrow in each row and opening of furrow in fourth row over flat bed sowing of soybean which resulted in higher seed yield and thus ultimately gave higher gross and net monetary returns. Opening of furrow in each row also produced highest B:C ratio.

Table 2
Oil content of soybean (%) as influenced by various treatments

Treatments	*Oil content (%)*
Integrated nutrient management (3)	
N_1 : Rhizobium + FYM @ 5t ha^{-1}	19.96
N_2 : Recommended dose of fertilizer	20.15
N_3 : Rhizobium + RDF + FYM @ 5t ha^{-1}	20.54
$S.E_m \pm$	0.26
C.D. at 5 %	NS
Moisture conservation practices (3)	
M_1 : Flat bed	20.47
M_2 : Opening of furrow in each row	20.83
M_3 : Opening of furrow in fourth row	20.32
$S.E_m \pm$	0.30
C.D. at 5%	NS
Interaction (N × M)	
$S.E_m \pm$	0.52
C.D. at 5%	NS
General mean	20.37

Effect of Moisture Conservation Practices on Quality of Soybean

The influence of various treatments on the oil content was not turn out to be significant. However, opening of furrow in each row (M_2) recorded numerically higher oil content (20.83%) than rest of the treatments. Similar results were reported by Shinde *et. al.* (2009).

Interaction Effect of Integrated Nutrient Management and Moisture Conservation Practices on Soybean

The interaction effect between integrated nutrient management and *insitu* moisture conservation practices did not influenced the various yield attributes, seed yield, straw yield, biological yield, gross monetary returns and net monetary returns of soybean.

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