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# Influence of Integrated Nutrient Management on Growth, Yield and Economics of Foxtail Millet

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**ABSTRACT**

Field experiments were conducted at Obannavaripalem village, Nagauppalapadu Mandal, Prakasam district, Andhra Pradesh during *kharif* seasons of 2014 and 2015 to study the effect of different integrated nutrient management practices with special reference to N for *kharif* foxtail millet on yield and economics. The results revealed that on clay loamy soils of Krishna Agroclimatic zone of Andhra Pradesh, application of 125%RDN + FYM @ 5 t $ha^{-1}$ recorded the highest foxtail millet , grain, stover yield and B:C ratio among the treatments.

**Key words:** *Economics, Foxtail millet and FYM, Growth, Nitrogen management and Yield.*

Foxtail millet is one of the oldest cultivated small millets both for food and fodder. It ranks second in the total world production of millets and it continues to have an important place in world agriculture providing food for millions of people in arid and semiarid regions. It is native to China and regarded as an elite drought–tolerant crop. Andhra Pradesh, Karnataka and Tamil Nadu are the major foxtail millet growing states in India contributing about 79 per cent of the total area (Munirathnam *et al,* 2006).

The yield potential of foxtail millet is low in India compared to the potentially achievable yield because of inadequate application of fertilizers, conventional cultivation of low yielding cultivars and lack of good management practices. Maximum yield potential can be achieved by using higher rates of fertilizer application. The crop is tolerant to drought and mostly grown under marginal soils and waste lands having very low levels of nutrients and organic matter and poor water holding capacity. Although the crop is grown since time immemorial in India and especially in Andhra Pradesh, not much attention was paid to improve the productivity.

## MATERIAL AND METHOD

The trial was conducted during *kharif* 2014 and 2015 on clay loam soils at Obennapalem village, Nagauppalapadu Mandal , Prakasam district, Andhra Pradesh. The treatments included five levels of fertilizer *viz.,* Control ($T_1$), 100 % RDN ($T_2$), 100 % RDN + FYM @ 5t $ha^{-1}$ ($T_3$), 125 % RDN ($T_4$) and 125 % RDN + FYM @ 5t $ha^{-1}$ laid out in Randomized Block Design and replicated four times. The foxtail millet variety Sreelakshmi was sown in lines opened at 22.5 cm apart. The recommended dose of $P_2O_5$ @ 20 kg $ha^{-1}$ was applied to all the treatments uniformly. Nitrogen and FYM were applied at the time of sowing. The plant height, drymatter accumulation were recorded at different growth stages. The grain and stover yield were recorded at maturity.

## RESULTS AND DISCUSSION

An adequate supply of nutrient is necessary for metabolic activity as it finally affects the vegetative as well as reproductive phases. Plant growth greatly depends on drymatter accumulation during growth period with increase in the levels of fertilizers. Plant height at maturity was significantly influenced by nitrogen levels. Among the nitrogen levels, nitrogen applied at 125 % RDN + FYM @ 5.0 t $ha^{-1}$ recorded significantly the highest plant height (92.1 and 94.7 cm) over 100 % RDN (88.9 and 89.4 cm) and was on a par with 125 % RDN (90.8 and 93.4 cm) and 100 % RDN + FYM @ 5.0 t $ha^{-1}$. However, applying 100 % RDN + FYM @ 5.0 t $ha^{-1}$ was on par with 100 % RDN. The plants exhibited the shortest stature with no nitrogen application (Table 1). It could be attributed to the fact that higher nitrogen levels might have accelerated the synthesis of more chlorophyll and amino acids and stimulated the cellular activity, which is useful for the process of cell division and meristematic growth Similar results of taller plants at higher nitrogen levels and shorter plants at lower nitrogen was also reported by Intodia (1994) and Saini and Negi (1996), Kalaghatagi *et al*., 2000.

At maturity, drymatter production of foxtail millet was found to be significantly higher with the application of the highest nitrogen level of 125 % RDN + FYM @ 5.0 t $ha^{-1}$ tried which was followed by 125 % RDN. The lowest drymatter production was obtained with no nitrogen application. Increased drymatter accumulation. This might be due to increased

**Table 1. Plant height and drymatter accumulation of foxtail millet at maturity stage as influenced by different integrated nutrient management practices during 2014 and 2015 *kharif***

| Treatments | 2014 | | 2015 | |
|---|---|---|---|---|
| | Plant height at maturity (cm) | Drymatter accumulation at maturity (kg $ha^{-1}$) | Plant height at maturity (cm) | Drymatter accumulation at maturity (kg $ha^{-1}$) |
| Control | 59.6 | 2538 | 61.4 | 2563 |
| 100% RDN | 88.9 | 3690 | 89.4 | 3813 |
| 100% RDN + FYM @ 5.0 t $ha^{-1}$ | 89.7 | 3913 | 91.5 | 4058 |
| 125% RDN | 90.8 | 4682 | 93.4 | 4695 |
| 125% RDN + FYM @ 5.0 t $ha^{-1}$ | 92.1 | 4840 | 94.7 | 4935 |
| SEm(±) | 1.4 | 56.9 | 0.9 | 81.8 |
| CD (p=0.05) | 4.3 | 171 | 2.8 | 246.7 |

**Table 2. Grain yield and stover yield of foxtail millet as influenced by different integrated nutrient management practices during 2014 and 2015 *kharif***

| Treatments | 2014 | | 2015 | |
|---|---|---|---|---|
| | Grain yield (kg $ha^{-1}$) | Stover yield (kg $ha^{-1}$) | Grain yield (kg $ha^{-1}$) | Stover yield (kg $ha^{-1}$) |
| Control | 1666 | 2881 | 1719 | 3187 |
| 100% RDN | 2099 | 4167 | 2120 | 4262 |
| 100% RDN + FYM @ 5.0 t $ha^{-}$ | 2356 | 4630 | 2441 | 4655 |
| 125% RDN | 2627 | 4600 | 2633 | 4812 |
| 125% RDN + FYM @ 5.0 t $ha^{-}$ | 2701 | 4805 | 2708 | 4825 |
| SEm(±) | 40.9 | 111.5 | 46.3 | 67.6 |
| CD (p=0.05) | 123 | 157.7 | 139 | 203 |

**Table 3. Gross returns (Rs $ha^{-1}$), Net returns returns (Rs $ha^{-1}$) and BC ratio of foxtail millet as influenced by different integrated nutrient management practices during 2014 and 2015 *kharif***

| Treatments | 2014 | | | 2015 | | |
|---|---|---|---|---|---|---|
| | Gross returns | Net returns | BC ratio | Gross returns | Net returns | BC ratio |
| Control | 41650 | 22950 | 1.23 | 42975 | 24275 | 1.3 |
| 100% RDN | 52475 | 33250 | 1.73 | 53000 | 33775 | 1.76 |
| 100% RDN + FYM @ 5.0 t $ha^{-1}$ | 58900 | 34675 | 1.43 | 61000 | 36775 | 1.52 |
| 125% RDN | 65675 | 46250 | 2.38 | 65750 | 46325 | 2.38 |
| 125% RDN + FYM @ 5.0 t $ha^{-1}$ | 67500 | 43150 | 1.77 | 69500 | 45150 | 1.85 |

plant height and higher number of tillers $m^{-2}$ which in turn resulted in more photosynthates which accumulated higher quantity of drymatter with levels of nitrogen. As evidenced in this investigation the results corroborates with the findings of Naik *et al*. (1995), Basavarajappa *et al.*(2002) and Hasan *et al*. (2013).

There was a significant increase in seed yield with increasing N levels. Application of 125 % RDN + FYM @ 5.0 t $ha^{-1}$ recorded the highest grain yield of 2701 and 2709 kg $ha^{-1}$ during the first and second years of study respectively, which was significantly superior to the other nitrogen levels tried, followed by 125% RDN. The lowest grain yield was observed with no nitrogen application. Applying 100 % RDN gave 1666 and 1719 kg $ha^{-1}$ grain yield during first and second years of the study, respectively and was found significantly the lowest. Application of 125 % RDN + FYM @ 5.0 t $ha^{-1}$ increased the seed yield by 38.3 and 36.5 per cent over no nitrogen application in 2014 and 2015, respectively. The improvement in seed yield with enhanced nitrogen application might be attributed to better availability and uptake of nutrients which in turn might have lead to efficient metabolism. Higher levels of biomass accumulation and efficient translocation of photosynthates from source to sink might be responsible for the increased seed yields. The above results are in conformity with the findings of several researchers such as Kalaghatagi *et al.* (2000), Basavarajappa *et al.* (2002).

Among the nitrogen levels, application of 125 % RDN + FYM @ 5.0 t $ha^{-1}$ recorded the highest stover yield (4805 and 4825 kg $ha^{-1}$ during first and second years of study) which was statically on par with application of 125 % RDN and was significantly higher than no nitrogen application. Significantly lowest straw yield of foxtail millet (2881 and 3188 kg $ha^{-1}$ during the first and second years of the experimentation, respectively) was obtained with no nitrogen application (Table 2).

**Economics**

The highest net returns were registered with application of 125 % RDN. The next best treatment was application of 125 % RDN + FYM @ 5t $ha^{-1}$. The lowest net returns were recorded with no nitrogen application. The higher net returns might be due to higher grain and straw yields registered under higher nitrogen levels. Present investigation confirms the results reported by Divya and Maurya (2013).

The highest net monetary returns and benefit : cost ratio were recorded with 125% RDN applied through chemical fertilizers than rest of the treatments (Table 3). This could be due to the manifestation of higher grain and stover yields fetching of higher net returns at increased level of nitrogen. Similar results were reported by Divya and Maurya (2013).

**CONCLUSION**

Application of 125%RDN along with FYM @ 5 t $ha^{-1}$ recorded the highest foxtail millet plant height at maturity, grain, stover yield and B:C ratio.

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