**SHORT COMMUNICATION**

# EFFECT OF TILLAGE PRACTICES AND INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, ANALYSIS PARAMETERS OF SORGHUM (*SORGHUM BICOLOR* L.)

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**Abstract:** An experiment was conducted during kharif 2009 & 2010 at the Rajmata Vijyaraje Scindia Krishi Vishwa Vidyalaya College of Agriculture, Indore (M.P.) to study on the effect of tillage practiced and integrated nutrient management on growth, analysis parameters of sorghum. Tillage practices influenced only leaf area significant; chlorophyll content and leaf area index remained unchanged at all the growth stages. Reduced tillage encouraged all these parameters are others. Amongst INM treatments, 100% RDF ($N_{80}$ $P_{40}K_{40}$) recorded above parameters up to maximum. Crop growth rate, relative growth rate and net assimilation rate remained unchanged due to tillage practices and INM treatments, reduced tillage recorded maximum Dry matter, grain and stover yields. In case of integrated nutrient management, 100% Recommended dose of fertilizer (80:40:40) and 75% Recommended dose of fertilizer (60:30:30) +5t FYM/ ha recorded equally higher grain and stover yields, being significantly superior to other fertility levels.

**Keywords:** Tillage practices, Integrated nutrient management, Growth analysis parameters, Sorghum

## INTRODUCTION

The optimum tillage system is one of the most critical inputs required to make proper seed bed for maximum germination, emergence and establishment of sown seeds. Integrated nutrient management is basically the complementary use of chemical fertilizers and organic as well as biological sources of plant nutrients. Both these crop production technologies influence the growth and yield of sorghum crop under a given set of agro climatic conditions.

The leaves and leaf area index are the important parameters for maximum photosynthetic efficiency which is ultimately related to crop production. The growth analysis is an important device which provides an eco-physiological evaluation of the applied crop production technologies for analyzing the complex character of productivity.

Such information was lacking, hence the present experiment was planned to study the photosynthetic efficiency of leaves measured in terms of their area, weight and distribution of assimilates to the sink for net productivity per unit time.

## MATERIAL AND METHOD

The experiment was conducted during kharif 2009 & 2010 at the RVS Krishi Vishwa Vidyalaya, College of Agriculture, Indore (M.P.). The soil of the experimental field was a typical black with dominance of montmorillonite clay content. The soil pH was 7.65, electrical conductivity 0.39 dS/m, organic carbon 0.48 %, available N, $P_2O_5$ and $K_2O$ 212, 13.5 and 481 kg/ha, respectively. The total rainfall received during June to October, 2010 was 896.6 mm with 40 rainy days. The treatments comprised three tillage practices (conventional tillage having 1 summer ploughing +2 harrowing +Atrazine (preemergance+1 hoeing +1HW; reduced tillage having all practices as in conventional tillage except summer ploughing and minimum tillage having 1 harrowing + Atrazine+1 hoeing +1 HW) in the main plots and four nutrient management treatments (100% RDN i.e. $N_{80}$ $P_{40}$ $K_{40}$ through inorganic, 75% RDN +5t FYM/ha, 50% RDN+2.5t FYM/ha + Azotobacter + PSM, and control i.e. native fertility) in the sub-plots. The experiment was laid out in split plot design keeping three replications. The Sorghum was CSH-16 was sown on 1 July, 2010 keeping seed rate 8 kg/ha, row distance 45 cm and plant distance 12 cm. Nitrogen, phosphorus and potash was given through urea and mutriate of potash, respectively. The crop was grown as per recommended package of practices but without any irrigation. The crop was harvested on 24 October, 2010. The percent concentration of N, P and K in grain and stover was determined through the standard procedures. The nutrient uptake per hectare by grain and stover was worked out by multiplying each of the percentage of nutrient content with each of the grain or stover yield of sorghum [1]. The chlorophyll content was determined by acetone extraction method [2].

The growth analysis parameters were determined as per standard procedures.

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**Table 1.** Chlorophyll content and growth analysis parameters of sorghum as influenced by tillage practices and integrated nutrient management (Mean of two years)

| Treatments | Chlorophyll content (SPAD) | Leaf Area ($cm^2$) | Leaf area index |
|---|---|---|---|
| | 90 DAS | 90 DAS | 90 DAS |
| **Tillage Practices** | | | |
| Conventional Tillage | 47.63 | 3530 | 6.47 |
| Reduced Tillage | 53.25 | 3685 | 6.78 |
| Minimum Tillage | 47.4 | 3434 | 6.28 |
| C.D.(*P*=0.05) | NS | 202.11 | NS |
| **Integrated Nutrient Management** | | | |
| 100 % RDF | 51.44 | 3733 | 6.78 |
| 75% RDF + 5t FYM/ha | 50.66 | 3566 | 6.67 |
| 50 % RDF +2.5t FYM/ha +*Aztobacter* + PSM | 49.15 | 3474 | 6.42 |
| Native fertility (Control) | 46.45 | 3425 | 6.17 |
| C.D.(*P*=0.05) | NS | 80.28 | 0.45 |

**Table 2.** Crop growth rate, relative growth rate and net assimilation rate of sorghum as influenced by tillage practices and integrated nutrient management (Mean of two years)

| Treatments | CGR ($g/dm^2$ GA/day) | RGR (mg dry matter) | NAR ($g/dm^2$ LA/day) |
|---|---|---|---|
| | 90 DAS | 90 DAS | 90 DAS |
| **Tillage Practices** | | | |
| Conventional Tillage | 1.10 | 54.00 | 0.32 |
| Reduced Tillage | 1.20 | 83.00 | 0.40 |
| Minimum Tillage | 1.22 | 84.00 | 0.46 |
| C.D. at 5% | 1.10 | 0.65 | 0.09 |
| **Integrated Nutrient Management** | | | |
| 100 % RDF | 0.70 | 0.287 | 0.16 |
| 75% RDF + 5t FYM/ha | 1.40 | 0.165 | 0.10 |
| 50 % RDF +2.5t FYM/ha +*Aztobacter* + PSM | 1.10 | 0.212 | 0.12 |
| Native fertility (Control) | 1.60 | 0.178 | 0.09 |
| C.D.(*P*=0.05) | 0.10 | 0.10 | NS |

**Table 3.** Dry matter/plant grain and stover yields and economical grain from sorghum as influenced by tillage practices and integrated nutrient management

| Treatments | Dry matter/ plant (g) | Yield (q/ha) | | Net return(Rs./ha) | B:C ratio |
|---|---|---|---|---|---|
| | 90 DAS | Grain | Stover | | |
| **Tillage Practices** | | | | | |
| Conventional Tillage | 141.17 | 50.56 | 114.7 | 39942 | 3.78 |
| Reduced Tillage | 142.54 | 51.50 | 120.8 | 42250 | 4.13 |
| Minimum Tillage | 139.54 | 47.37 | 107.8 | 38040 | 3.95 |
| C.D. at 5% | 1.36 | 2.22 | 9.5 | - | - |
| **Integrated Nutrient Management** | | | | | |
| 100 % RDF | 143.04 | 52.75 | 123.7 | 43640 | 4.23 |
| 75% RDF + 5t FYM/ha | 142.38 | 53.77 | 123.6 | 42281 | 3.68 |
| 50 % RDF +2.5t FYM/ha +*Aztobacter* + PSM | 140.41 | 47.07 | 110.4 | 37054 | 3.65 |
| Native fertility (Control) | 138.39 | 45.66 | 100.0 | 37334 | 4.26 |
| C.D.(*P*=0.05) | 1.28 | 4.87 | 9.7 | - | - |

## RESULT AND DISCUSSION

### Growth and yield attributes

The periodical observations data (Table 1) indicate that the chlorophyll content leaf area and leaf area index were increased with the advancement of plant growth up to 90 days stage. This was due to decrease of functional leaves because of shedding of older leaves beyond 90 days stage. SPAD-502, a hand held chlorophyll meter was used for rapid and non destructive estimation of extractable chlorophyll in leaves [3].

Different tillage practices influenced only the leaf area (LA) up to significant extent, whereas chlorophyll content and leaf area index (LAI), remained unchanged at all the growth stages. However all these parameters were encouraged considerably due to reduced tillage over conventional and minimum tillage practices. Reported that the high water holding capacity in no tillage system is due to soil organic contents[4].

Among the INM treatments, 100% RDF resulted in maximum chlorophyll content, LA and LAI at every growth stage. This was followed by 75% RDF +5t FYM/ha and them 50 % RDF + 2.5t FYM/ha+ Azotobacter +PSB. The maximum benefit from 100% RDF may be attributed to immediate increased availability of major nutrients thereby increased photosynthetic process for plant growth. Besides low, variable and generally unbalanced nutrient

contents, it is difficult to provide the proper nutrient balance to meet crop requirements with bulky organic manure [5].

Crop growth rate, relative growth rate and net assimilation rate tended to decrease rapidly beyond 30 days stage of growth. The different tillage practices as well as INM treatments did not extent any significant changes in these growth analysis parameters almost at all the stages (Table 2). Returning of crop residues to soil was important for favourable soil structure, soil and water conservation [6].

Among the tillage practices, reduced tillage performed the best with respect to DM production / plant at every stage. Accordingly the reduced tillage resulted in significantly higher grain yield (51.50 q/ha) and stover yield (120.8 q/ha) as compared to minimum tillage. The effect of conventional tillage was at per with that of reduced tillage (Table 3). This was owing to increased leaf area photosynthetic surface as a result of better soil conditions created by both these tillage practices. The results are in close agreement with those of [7]&[8].

In case of INM, 100% RDF and 75% RDF +5t FYM/ha recorded equally higher grain yields (52.75 to 53.77 q/ha) and stover yields (123.6 to 123.7 q/ha), being significantly superior to 50% RDF + 2.5t FYM/ha + Azotobacter. + PSB and control treatments. This was attributed to increased and immediate supply of NPK there by increased production and translocation of photosynthates for the growing plants. These results conforms the findings of [9]&[10].

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