

INFLUENCE OF LAND CONFIGURATION AND INTEGRATED NUTRIENT MANAGEMENT ON LEAF AREA INDEX AND YIELD OF RABI SORGHUM VARIETIES GROWN ON COASTAL SALT AFFECTED SOILS

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ABSTRACT

A field experiment to study the influence of land configuration and integrated nutrient management on leaf area index and yield of rabi sorghum varieties grown on coastal salt affected soils was conducted during rabi seasons of 2010-11 and 2011-12 at Coastal Soil Salinity Research Station, Navsari Agricultural University, Danti-Umbharat (Gujarat). The magnitude of increase in leaf area index under raised bed was to the tune of 10.7 per cent at harvest as compared to flat bed sowing. Sorghum sown on raised bed recorded significantly superior grain and stover yield as compared to flat bed. Leaf area index at harvest was significantly higher in variety GJ 38, but remained at par with variety BP 53, also significantly higher grain and stover yield of sorghum was recorded with the variety GJ 38 as compared to rest of varieties CSV 216R and BP 53. Leaf area index of sorghum was increased with application of 100 % RDF along with 10 FYM @ 10 t/ha. Among different integrated nutrient management, application of 100 % RDF + FYM @ 10t/ha gave significantly superior grain and stover yields of sorghum as compared to 100 % RDF alone and 75 % RDF + FYM @ 10 t/ha.

KEY WORDS: *Integrated nutrient management, land configuration, leaf area index, sorghum*

INTRODUCTION

Sorghum is an exhaustive crop of soil nutrients. The deteriorating soil health, declining soil organic matter and increase of micronutrient deficiencies has put a big question mark on the sustainability of sorghum production. Planting of crop on raised-bed, usually 60 cm wide, with 2 rows on top of each bed, the furrows between the beds are used for irrigation water application. This

system does allow the use of furrow irrigation, which provides water management and reduce seed rates than the conventional flat bed planting in wheat (Jat *et al.*, 2005). The yield potential of sorghum is yet low due to use of old traditional varieties by majority of farmers. The improved varieties have a great potentiality because of their high yielding capacity, short duration and responsiveness to high fertilization. The potential sources

of nutrients include chemical fertilizers, bulky organic manures and bio-fertilizers. Integrated nutrient management enhances both uptakes of nutrients by the crop and availability of soil nutrients during growing seasons of the crop.

MATERIALS AND METHODS

A field experiment was conducted at Coastal Soil Salinity Research Station, Navsari Agricultural University, Danti-Umbharat (Gujarat) during *rabi* seasons of 2010-11 and 2011-12 to study the influence of land configuration and integrated nutrient management on leaf area index and yield of *rabi* sorghum varieties grown on coastal salt affected soils. The experiment was laid out in split plot design with four replications. Two land configuration viz., L₁: Raised bed and L₂: Flat bed and three varieties V₁: GJ 38, V₂: CSV 216R and V₃: BP 53 were kept as the main plot treatment, while three levels of integrated nutrient management F₁: 100 % RDF (80:40:00 NPK kg/ha), F₂: 75 % RDF + FYM @ 10 t/ha, F₃: 100 % RDF + FYM @ 10 t/ha in sub-plots. The soil of the experimental soil is calcareous in nature with low in available nitrogen and high in available phosphorus and potassium. The statistical analysis was carried through analysis of variance technique as described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Effect of land configuration

A significant increase in leaf area index was observed at harvest under raised bed (3.70) as compared to flat bed sowing (3.52). This might be due to improved drainage and soil aeration under raised bed, which provides better environment for root growth, soil environment and availability of nutrients enabling plants for better growth and development. Sorghum sown on raised bed recorded

significantly superior grain and stover yield as compared to flat bed. The mean grain yield advantage under raised bed sowing was 14.53, 12.02 and 13.30 per cent, whereas for stover yield was 18.68, 14.17 and 16.48 per cent over flat bed during individual years as well as in pooled analysis, respectively. The results are in corroboration with the early findings of Patil and Sheelavantar (2000), Anonymous (2007), Bhat and Mahal (2006) and Sepat *et al.* (2010).

Effect of variety

Leaf area index at harvest was significantly higher in variety GJ 38 (3.96) and remained at par with variety BP 53 (3.80). Variety exerted significant effect on grain yield and stover yield during both the years as well as in pooled analysis. Significantly superior grain and stover yield of sorghum was recorded with the variety V₁ (GJ 38) during individual years and in pooled analysis, respectively as compared to rest of the two varieties. Similar findings were also reported by Patil and Basappa (2004) at Bellary, who observed that varieties M 35-1, SPV 1413, Mouli and SPV 1359 had significantly higher grain yields than other varieties due to higher panicle length, panicle diameter, panicle mass per plant and grain mass per plant. However, varieties V₂ and V₃ remained at par with each other during both the years of experimentation and in pooled analysis also.

Effect of integrated nutrient management

Leaf area index of sorghum increased with the application of 100 % RDF along with FYM @ 10 t/ha, which may be attributed to expanded leaf area as result of increased cell division and enlargement due to better plant nutrition. Patidar and Mali (2004) also observed that application of FYM

over no FYM and application of 100 % RDF over other rate increased leaf area index of sorghum. Among integrated nutrient management, application of 100 % RDF + FYM @ 10 t/ha to sorghum gave significantly superior grain and stover yields as compared to 100 % RDF alone and 75 % RDF + FYM @ 10 t/ha. On the basis of pooled analysis, grain yield advantage under 100 % RDF + FYM @ 10 t/ha was 12.13 and 15.64 per cent, whereas for stover yield, it was 11.53 and 16.60 per cent over 100 % RDF and 75% RDF + FYM @ 10 t/ha treatments, respectively. The remarkable increase in grain and stover yield under treatment of 100 % RDF + FYM @ 10 t/ha might be due various growth attributes and yield attributes. These findings are in close agreement with those reported by Ponnuswamy *et al.* (2002), Sonune *et al.* (2003), Patidar and Mali (2004) and Biradar and Gollagi (2006) in sorghum crop, while Pandey *et al.* (2009) in wheat crop.

Interaction effect

The interaction between land configuration, variety and integrated nutrient management was non-significant with respect to all leaf area index, grain yield and stover yield.

CONCLUSION

From the results, it can be concluded that the magnitude of increase in leaf area index under raised bed was high as compared to flat bed sowing. Sorghum sown on raised bed recorded significantly superior grain and stover yield as compared to flat bed. Leaf area index at harvest, grain and stover yield was significantly higher in variety GJ 38 as compared to other varieties tested. Leaf area index of sorghum was increased with application of 100 % RDF along with 10 FYM @ 10 t/ha. Among different integrated nutrient management, application of 100 % RDF + FYM @

10t/ha gave significantly superior grain and stover yields of sorghum as compared to 100 % RDF alone and 75 % RDF + FYM @ 10 t/ha.

REFERENCES

- Anonymous (2007). Report of Natural Resources Management Subcommittee. pp: 1-9.
- Bhat, M. A. and Mahal, S. S. (2006). Performance of wheat (*Triticum aestivum* L.) genotypes under different planting and weed control methods. *Crop Res.*, **32**(2): 153-156.
- Biradar, B. D. and Gollagi, S. G. (2006). Performance of rabi sorghum under different sowing dates and nutrient management practices. *Crop Res.*, **32**(2): 165-167.
- Jat, M. L.; Singh S.; Rai, H. K.; Chhokar, R. S.; Sharma, S. K. and Gupta, R. K. (2005). Furrow irrigation raised bed (FIRB) planting techniques for diversification of rice-wheat system in Indo-Gangetic plains. *Japan Assoc. Int. Collabo. Agric. Forestry*, **28**(1): 25-42.
- Pandey, I. B.; Dwivedi, D. K. and Pandey, R. K. (2009). Integrated nutrient management for sustaining wheat (*Triticum aestivum*) production under late sown condition. *Indian J. Agron.*, **54**(3): 306-309.
- Panase, V. G. and Sukhatme, P. V. (1985). "Statistical Methods for Agricultural Workers". ICAR, New Delhi.
- Patidar, M. and Mali, A. L. (2004). Effect of farmyard manure, fertility levels and bio-fertilizers on growth, yield and quality of sorghum

- (*Sorghum bicolor*). *Indian J. Agron.*, **49**(2): 117-120.
- Patil, S. L. and Basappa, H. (2004). Suitable sorghum varieties for post-rainy season in vertisols in Bellary, India. *ISMN* **45**: 24-25.
- Patil, S. L. and Sheelavantar, M. N. (2000). Yield and yield components of rabi sorghum (*Sorghum bicolor*) as influenced by in situ moisture conservation practices and integrated nutrient management in vertisols of semi-arid tropics of India. *Indian J. Agron.*, **45**(1): 132-137.
- Ponnuswamy, K.; Subbian, P.; Santhi, P. and Sankaran, N. (2002). Integrated nutrient management for rainfed sorghum. *Crop Res.*, **23** (2): 243-246.
- Sepat, R. N.; Rai, R. K. and Dhar, S. (2010). Planting systems and integrated nutrient management for enhanced wheat (*Triticum aestivum*) productivity. *Indian J. Agron.*, **55**(2): 114-118.
- Sonune, B. A.; Tayade, K. B.; Gabhane, V. V. and Puranik, R. B. (2003). Long term effect of manuring and fertilization on fertility and crop productivity of vertisols under sorghum-wheat sequence. *Crop Res.*, **25**(3): 460-46

Table 1: Leaf area index of sorghum as influenced by land configuration, variety and integrated nutrient management

Treatments	30 DAS			60 DAS			90 DAS			At harvest		
	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
Land Configuration												
L ₁	1.17	1.22	1.19	3.20	3.30	3.25	4.93	5.00	4.96	3.60	3.80	3.70
L ₂	1.14	1.19	1.16	3.07	3.13	3.10	4.73	4.77	4.75	3.45	3.58	3.52
S.Em±	0.01	0.01	0.01	0.04	0.04	0.03	0.07	0.08	0.05	0.05	0.06	0.04
C.D. (0.05)	NS	NS	0.02	0.12	0.11	0.08	0.20	NS	0.15	0.14	0.18	0.11
Variety												
V ₁	1.26	1.30	1.28	3.43	3.51	3.47	5.28	5.32	5.30	3.87	4.05	3.96
V ₂	1.00	1.04	1.02	2.67	2.74	2.70	4.11	4.18	4.14	3.00	3.12	3.06
V ₃	1.21	1.27	1.24	3.30	3.39	3.35	5.10	5.16	5.13	3.71	3.89	3.80
S.Em±	0.02	0.01	0.01	0.05	0.04	0.05	0.08	0.10	0.09	0.06	0.07	0.07
C.D. (0.05)	0.05	0.04	0.04	0.15	0.13	0.14	0.24	0.29	0.26	0.17	0.22	0.19
C.V. (%)	6.4	5.1	5.7	7.9	6.8	7.4	8.2	9.6	8.9	7.9	9.7	8.9
Interactions	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Integrated Nutrient Management												
F ₁	1.16	1.20	1.18	3.14	3.23	3.19	4.83	4.92	4.87	3.55	3.70	3.62
F ₂	1.15	1.20	1.18	3.05	3.09	3.07	4.70	4.71	4.71	3.43	3.53	3.48
F ₃	1.15	1.20	1.18	3.21	3.33	3.27	4.94	5.03	4.99	3.61	3.84	3.72
S.Em±	0.01	0.01	0.01	0.04	0.04	0.03	0.06	0.09	0.05	0.05	0.06	0.04
C.D. (0.05)	NS	NS	NS	0.11	0.11	0.07	0.17	0.25	0.15	0.13	0.18	0.11
C.V. (%)	4.5	4.2	4.3	5.9	5.6	5.8	6.1	8.8	7.6	6.3	8.5	7.6
Interactions	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

L₁: Raised bed, L₂: Flat bed; V₁: GJ 38, V₂: CSV 216R, V₃: BP 53;

F₁: 100 % RDF (80 : 40 : 00 NPK kg/ha), F₂: 75 % RDF + FYM @ 10 t/ha, F₃: 100 % RDF + FYM @ 10 t/ha

Table 2: Grain and stover yield (kg/ha) of sorghum influenced by land configuration, variety and integrated nutrient management

Treatments	Grain Yield (kg/ha)			Stover yield (kg/ha)		
	2010-11	2011-12	Pooled	2010-11	2011-12	Pooled
Land Configuration						
L ₁	3429	3332	3381	8705	8250	8478
L ₂	2931	2932	2931	7079	7082	7080
S.Em _±	54.7	80.5	48.7	151.5	167.7	113.0
C.D. (0.05)	165	243	141	457	505	326
Variety						
V ₁	3391	3450	3420	8548	8415	8481
V ₂	3143	3020	3081	7806	7360	7583
V ₃	3007	2925	2966	7322	7223	7272
S.Em _±	67.0	98.6	84.3	185.6	205.3	195.7
C.D. (0.05)	202	297	244	559	619	565
C.V. (%)	10.3	15.4	13.1	11.5	13.1	12.3
Interactions	NS	NS	NS	NS	NS	NS
Integrated Nutrient Management						
F ₁	3128	2984	3056	7780	7407	7594
F ₂	2984	2883	2934	7365	6953	7159
F ₃	3428	3529	3478	8531	8638	8584
S.Em _±	56.5	91.7	53.9	152.7	184.0	119.5
C.D. (0.05)	162	263	152	438	528	337
C.V. (%)	8.7	14.4	11.8	9.5	11.8	10.6
Interactions	NS	NS	NS	NS	NS	NS

L₁: Raised bed, L₂: Flat bed;

V₁: GJ 38, V₂: CSV 216R, V₃: BP 53;

F₁: 100 % RDF (80 : 40 : 00 NPK kg/ha), F₂: 75 % RDF + FYM @ 10 t/ha, F₃: 100 % RDF + FYM @ 10 t/ha

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