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EFFECT OF FOLIAR NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF SUMMER FORAGE SORGHUM

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SUMMARY

A field experiment was carried out at Post Graduate Instructional Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra) during summer, 2018. The experiment was laid out in Randomized Block Design with nine treatments and three replications. The green fodder yield (589.83 q/ha) and dry matter yield (120.50 q/ha) were significantly higher under application of GRDF (Gross Recommended Dose of Fertilizers) along with foliar application of 2% urea at 40 days after sowing. The extent of expression of quality parameters such as crude fibre content (%), IVDMD were not significantly influenced by different treatments but crude protein yield (10.07 q/ha) and crude fibre yield (35.19 q/ha) were significantly higher under application of GRDF along with foliar application of 2% urea at 40 days after sowing. The application of GRDF along with foliar application of 2% urea at 40 days after sowing recorded significantly higher gross returns (Rs. 117966/ha) and net returns (Rs. 76620/ha).

Key words : Sorghum, green forage yield, crude protein, crude fibre, foliar nutrition, uptake, economics

Presently, the country is facing a net deficit of green fodder (35.6%), dry fodder (10.95%) and concentrated feeds (44%). Present availability of green fodder is 462 million tonnes and dry fodder availability is 394 million tonnes (Anonymous, 2016). Feeds and fodders are the most important components of animal output. Sorghum is an popular cereal fodder crop due to its excellent growing habit, high potential, better nutritive value and quick regrowth. Sorghum being a short duration, drought tolerant, well adaptive to arid regions is considered promising crop to overcome the fodder shortages. Besides this, it is also a moderately salt tolerant crop (Devi *et al*., 2018). It is a palatable and nutritious fodder crop for animals and there is enormous demand for green and dry fodder particularly during lean winter and summer season in arid and semi-arid region. Sorghum as a source of fodder and feed has the potential to meet the by dairy sector needs. Single cut forage sorghum varieties yields about 400-500 and 100-150 q/ha of green and dry fodder rich in quality (Satpal *et al*., 2020). For better efficiency of livestock, both the quantitative production of fodder and their quality play significant role. Quality of sorghum fodder suffers heavily if proper amount of fertilizers is not applied. Application of fertilizers to soil and due to formation of certain soil complexes the uptake of necessary elements becomes difficult for plants. The soil applied nutrients are not fully utilized by the plants. Plants can utilize water soluble nutrients through their foliage when applied in the form of foliar sprays. Fertilizer is single most important input for securing higher production. The time and method of fertilizer application plays very important role. Foliar application may constitute the most effective method of application. This method provides more rapid utilization of nutrient and permits the correction of observed deficiencies in less time. Considering this view, the experiment was conducted to study the effect of foliar nutrient management on growth, yield and quality of summer fodder sorghum.

MATERIALS AND METHODS

An experiment was conducted during summer season of 2018 at Post Graduate Instructional Farm, Department of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri. The meteorological data recorded on important weather parameters during April 2018 to June 2018 at Meteorological Observatory located at Water Management Project, Mahatma Phule Krishi Vidyapeeth, Rahuri are graphically depicted in Fig.1 to know the climatic condition during the period of investigation.

The maximum and minimum temperature was ranged from 34.14 to 40.65°C and from 19.74 to 25.20°C during crop period, respectively. The relative humidity

during morning and evening was ranged from 30.14 to 72.42 per cent and from 13.57 to 54.14 per cent, respectively and total 12.79 mm of rainfall was received. The maximum bright sunshine hours recorded was 10.84 hours in 17th MW of 2018. The minimum sunshine hours recorded was 3.82 hours during 23rd MW of 2018. The highest wind velocity was recorded 11.58 km hr^{-1} during 24th MW of 2018 and lowest wind velocity was recorded 1.64 km hr^{-1} during 15th MW of 2018.

The soils of experimental field was clay loam in texture, low in available nitrogen (140.56 kg/ha), medium in available phosphorus (17 kg/ha) and very high in available potassium (452 kg/ha). It was moderately alkaline in reaction (pH 8.28). Electrical conductivity of soil was 0.38 dSm^{-1} with 0.32 per cent organic carbon. The experiment was laid out in Randomized Block Design with three replication and nine treatments *viz*., T_1 – GRDF (5 t/ ha FYM + 100:50:40 kg/ha N, P_2O_5, K_2O), T_2 – GRDF + 2% foliar spray of urea, T_3 – GRDF + 2% foliar spray of DAP, T_4 – GRDF + 0.5% foliar spray of 20:20:20, T_5 – GRDF + 0.5% foliar spray of 12:61:0, T_6 – GRDF + 0.5% foliar spray of 13:0:45, T_7 – GRDF + 0.5 % foliar spray of 0:52:34, T_8 – GRDF + 0.5% foliar spray of 0:0:50, T_9 – GRDF + water spray. GRDF is Gross Recommended Dose of Fertilizers (5 t/ ha FYM + 100:50:40 kg/ha N, P_2O_5, K_2O). The application of half dose of N and full dose of P_2O_5 and K_2O as basal dose and half dose of N at 30 DAS, was applied and foliar spray of different water soluble fertilizers were undertaken at 40 DAS except treatment T_1. The forage sorghum variety used for experimentation was *Phule Godhan.*

RESULTS AND DISCUSSION

Growth attributing characters

The growth parameters viz. yield and quality of forage sorghum was influenced significantly due to different foliar nutrient management treatment. Significantly higher plant height (285.27 cm), number of functional leaves/plant (14.00), Leaf area/plant (35.50 dm^2) and leaf:stem ratio (0.25) were observed with application of GRDF + 2 % foliar spray of urea. However, it was at par with GRDF+2% foliar spray of DAP and GRDF + 0.5 % foliar spray of 20:20:20. The results are in agreement with those of Choudhary and Prabhu. (2014) and Kumawat *et al.* (2016). The different foliar nutrient management treatment had significant influence on green forage yield.

Yield and quality parameters

The application of GRDF + 2% foliar spray of urea recorded significantly higher green forage yield (589.83 q/ha), dry matter yield (120.50 q/ha), crude protein yield (10.07 q/ha), crude fibre yield (35.19 q/ ha). However, it was at par with GRDF + 2% foliar spray of DAP and GRDF + 0.5 % foliar spray of 20:20:20. The IVDMD remain unchanged due to various treatments. These results are in agreement with the findings of Damame *et al.* (2017).

Economics

The gross monetary returns, net monetary returns and benefit: cost ratio offorage sorghum was significantly influenced by different nutrient management treatments (Table 2). The application of

TABLE 1
Growth, yield and quality parameters of forage sorghum as affected by different foliar nutrient management treatments

Treatments	Plant height (cm)	No.of functional leaves/ plant	Leaf area/ plant	Leaf : stem ratio	Green forage yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude fibre yield (q/ha)	IVDMD %
T_1–GRDF (5 t/ha FYM+100:50:40 kg/ha N, P_2O_5, K_2O)	264.20	11.00	33.11	0.17	549.00	106.88	7.91	32.87	61.46
T_2–GRDF+2% foliar spray of urea	285.27	14.00	35.50	0.25	589.83	120.50	10.07	35.19	62.47
T_3–GRDF+2% foliar spray of DAP	280.13	13.50	35.00	0.24	580.00	117.97	9.87	35.11	62.20
T_4–GRDF+0.5% foliar spray of 20:20:20	279.00	12.20	34.70	0.22	571.00	115.63	9.58	34.52	62.11
T_5–GRDF+0.5% foliar spray of 12:61:0	273.03	13.00	34.60	0.23	565.83	114.41	9.17	34.22	62.00
T_6–GRDF+0.5% foliar spray of 13:0:45	275.00	11.80	34.40	0.21	560.83	111.04	8.55	33.50	61.88
T_7–GRDF+0.5% foliar spray of 0:52:34	273.47	12.50	34.03	0.22	555.33	111.89	8.69	33.61	61.70
T_8–GRDF+0.5% foliar spray of 0:0:50	270.00	12.00	33.22	0.20	553.67	110.45	8.40	33.46	61.67
T_9–GRDF+water spray	265.17	11.50	32.00	0.18	550.57	108.02	8.12	32.86	61.58
S. Em±	2.21	0.23	0.19	0.005	8.44	1.78	0.45	0.51	0.32
C. D. (P=0.05)	6.62	0.70	0.58	0.01	25.31	5.34	1.37	1.55	NS
General mean	273.92	12.39	34.06	0.21	564.01	112.98	8.94	33.93	61.90

TABLE 2
Nutrient uptake and economics of forage sorghum as affected by different foliar nutrient management treatments

Treatments	Total Nutrient Uptake (kg/ha)			Gross monetary returns (Rs.ha)	Cost of cultivation (Rs./ha)	Net monetary returns (Rs.ha)	B : C ratio
	N	P	K				
T_1–GRDF (5 t/ ha FYM+100:50:40 kg/ha N, P_2O_5, K_2O)	126.64	16.83	134.50	109800	40709	69091	2.69
T_2–GRDF+2% foliar spray of urea	161.22	22.03	143.87	117966	41346	76620	2.85
T_3–GRDF+2% foliar spray of DAP	158.03	28.21	146.50	116000	41577	74423	2.79
T_4–GRDF+0.5% foliar spray of 20:20:20	153.32	25.07	153.30	114200	41448	72752	2.75
T_5–GRDF+0.5% foliar spray of 12:61:0	146.81	27.42	141.77	113166	41318	71848	2.73
T_6–GRDF+0.5% foliar spray of 13:0:45	136.92	20.17	156.20	112166	41298	70868	2.71
T_7–GRDF+0.5% foliar spray of 0:52:34	139.16	23.43	152.57	111066	41400	69666	2.68
T_8–GRDF+0.5% foliar spray of 0:0:50	134.44	19.23	159.03	110734	41198	69536	2.68
T_9–GRDF+water spray	129.89	17.23	136.17	110114	41098	69016	2.67
S. Em±	3.49	0.51	0.53	1522	-	1522	-
C. D. (P=0.05)	10.47	1.54	1.61	4564	-	4564	-
General mean	142.96	22.18	147.10	112802	41266	71536	2.73

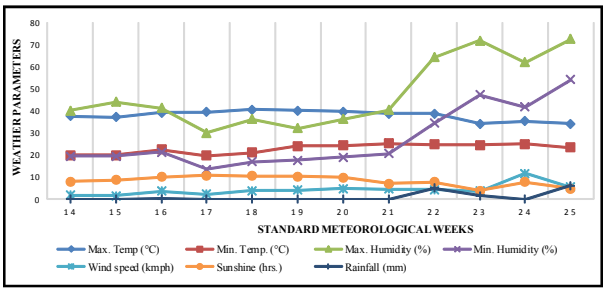

Fig. 1. Weekly meteorological data recorded during the experimental period.

GRDF along with foliar application of 2% urea at 40 days after sowing recorded significantly higher gross returns (Rs. 117966 /ha) and net returns (Rs. 76620/ha) and B : C ratio (2.85). These findings are in conformity with Naveed *et al.* (2014) and Kumawat *et al.* (2016).

Soil studies

The application of GRDF along with 2% foliar spray of urea, 2% foliar spray of DAP, 0.5% foliar spray of 0:0:50 was recorded significantly higher uptake of nitrogen, phosphorus and potassium, (161.22, 28.21, 159.03 kg/ha, respectively). Similar trend was indicated by Bochare (2015).

CONCLUSION

It can be concluded that, application of GRDF (5 t/ ha FYM + 100:50:40 kg/ha N, P_2O_5 & K_2O) along with foliar application of 2% urea at 40 days after sowing was found beneficial for increasing productivity and forage quality of forage sorghum *cv. Phule Godhan.*

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