The Pharma Innovation Journal 2021; 10 (10): 1646-1651

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10 (10): 1646-1651

www.thepharmajournal.com
Received: xx-08-2021
Accepted: xx-09-2021

Deepraj Verma
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ram Pratap Singh
Assistant Professor, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ankit Gupta
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Hariom Mishra
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Adesh
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Ram Pratap Pal
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Corresponding Author:
Deepraj Verma
M.Sc. Scholar, Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

To assess the effect of PGRs and micro-nutrient (Zn and B) on herbage yield and quality of produce on fodder sorghum (*Sorghum bicolor* L.)

Deepraj Verma, Ram Pratap Singh, Ankit Gupta, Hariom Mishra, Adesh and Ram Pratap pal

Abstract
The present investigation entitled **"**To assess the effect of PGRs and micro-nutrient on herbage yield and quality of produce on fodder sorghum (*Sorghum bicolor* L.)"A field experiment was conducted at G.P.B. Research Farm of, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during *Kharif* season of 2020. The experiment was laid out in Randomized block design with twelve treatments Triacontanol 10 ppm at 30 DAS (Foliar spray), Salicylic acid 100 ppm at 30 DAS (foliar spray), 5 Kg Zn ha^{-1} soil application, 2 Kg B ha^{-1} soil application, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application, 5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray, 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray and water spray at the time of PGR application.Results revealed that Application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray fodder sorghum was found more effective to enhance the growth and herbage yield and quality attributes of fodder sorghum.

Keywords: plant growth regulators, sorghum, growth parameter and yield, quality

1. Introduction
Sorghum (*Sorghum bicolor* (L.) is used for both grain and forage. While some varieties are grown solely for grain, others have been developed for forage production, and some varieties are dual-purpose (Harada *et al*., 2000) [1]. The sorghum plant is a tall, erect annual grass, up to 5 m high, and follows the C4 pathway. Sorghum roots are adventitious and the root system can extend from the top 90 cm soil layer to twice that depth. Culms are erect, solid, 0.6 to 5 m high and 5 to 30 mm in diameter. Leaves are broad, glabrous, very similar to maize leaves but shorter and broader. Inflorescence is a panicle, around 60 cm long, bearing up to 6000 spikelets (Balole *et al*., 2006) [2]. *Sorghum bicolor* is highly variable. The stem is the part of the plant that shows the greatest differences between genotypes, ranging from thin to thick, with low or multiple tillering (Rattunde *et al*., 2001) [3]. Sorghum is a C4 cereal fodder crop with high photosynthetic efficiency. It has good characteristics such as resistance to drought, resistance to poor drainage, tolerates a pH range of 5.0 to 8.5, some degree salinity resistance and high biomass yield etc. Sorghum can be grown on all types of soil except water logged and saline soil. In addition, the fodder and stover is fed to animals for milk and being used as industrial raw material for bio fuel (Koeppen *et al*., 2009) [4], refining sugar, paper making etc. It is the fifth most cultivated cereal around the world and is grown for ethanol production, forage, sugar, grain and fiber purposes (Yuan *et al*., 2008) [5].
In India the total area under cultivated fodder is 8.3 mha, on individual crop basis sorghum amongst covered the area (2.6 mha) with production of (92.30 mt) and green fodder productivity (35.5 tha^{-1}). At present forage requirement is 1097 million tonnes (green fodder) and 609 million tonnes (dry fodder) but availability is about 400.6 million tonnes (green fodder) and 466 million tonnes (dry fodder) which is on an average less than half of the requirement (Pal, 2016) [6]
Crop yields are increased with the application of micronutrients specially Zn and B. Average yield increase with B fertilizer was 20% in rice and maize, 21% in potato, 14% in cotton and wheat, 10% in peanut and 7% in sugar beet.

Whereas, average increase in yield with Zn application was 22% in sunflower and potato, 18% in maize,13% in wheat and 12% in rice, 11% in soybean and 8% each in cotton and sugarcane respectively (Rashid and Akhtar, 2006) [7]. Forage sorghum is widely grown for its fodder use as it is preferred over maize due to its high tolerance against stresses (Reddy *et al*., 2004) [8], but always carries some risk of toxicity to livestock, as almost all sorghum varieties contain the cyanogenic glucoside dhurrin (Conn, 1980) [9] which releases HCN on tissue disruption (Kojima *et al*., 1979) [10]. The amount of the cyanogenic glycoside dhurrin in sorghum varies depends on plant age and growth conditions.

Materials and Method

The experiment was conducted at G.P.B. Research Farm Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during *Karif* season of 2020-21. The soil of the experimental field was silt loam in texture with medium soil fertility.

The experiment was laid out in Randomized block design with twelve treatments Triacontanol 10 ppm at 30 DAS (Foliar spray), Salicylic acid 100 ppm at 30 DAS (foliar spray), 5 Kg Zn ha^{-1} soil application, 2 Kg B ha^{-1} soil application, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application, 5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray, 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray, 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray and water spray at the time of PGR application was used.

In case of fertilizers nitrogen were applied in the forms of Urea. Phosphorus was applied in field in different levels in the forms of DAP. Full dose of nitrogen and phosphorus were applied at the time of sowing, nitrogen is given in sorghum as a starter dose.

The seeds were sown on 12 July, 2020 of variety SSV 74 Sowing was done by line with a 3-4 cm depth. A certified seed was used @ Seed 40 Kg ha^{-1} in all the plots.

Result and Discussion

For this experiment the data were statistically analyzed and presented with the help of table. Following result should be obtained in this experiment.

Growth attributes

The data presented in Table-1 clearly indicate that initial plant population was found non significant due to effect of PGR and micronutrients (Zn and B) at 15 DAS. Maximum plant population (22 m^{-1} row length) was recorded in 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray and minimum (19 m^{-1} row length) in water spray at the time of PGR application.

Table 1: Effect of PGR and micronutrients (Zn and B) on plant population at 15 days after sowing of fodder sorghum

S. No.	Treatments	Plant population (m^{-1} row length)
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	20
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	19
T_3	5 Kg Zn ha^{-1} soil application	21
T_4	2 Kg B ha^{-1} soil application	20
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	20
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	20
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	19
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	20
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	21
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	22
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	20
T_{12}	Water spray at the time of PGR application	19
	SEm±	0.88
	CD at 5%	NS

The data on plant height recorded at 30th, 60 day after sowing and at harvest stage of crop growth have been presented in Table-2 clearly reveal that the plant height increased consistently from 30th days stage to harvest stage under application of PGR and micronutrients. However, the rate of increase in plant height was differed with different treatments.

Plant height was found significant at all the stage of crop growth except 30 days after sowing. The maximum plant height was observed 159.94cm and 210cm at 60 and at harvest stage, respectively, with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm at par with T_9, T_7, T_6, T_5, and T_3 is 141.46cm, 149.93cm, 153.12cm.151.58cm and 142.23cm, respectively, and lower value was observed in water spray at the time of PGR application similar trends was observed that harvest stage of crop.

The increase in plant height due to the PGR which promotes the mobilization and translocation of nutrients Zn and B in plants, resulting to enhance the cell division, cell elongation which increase in growth of plant. Similar results also be reported by Gunes *et al.* (2007) [11].

Table 2: Effect of PGR and Micronutrient (Zn & B) on plant height at different growth stages of fodder sorghum

S. No.	Treatment	Plant height (cm)		
		30 DAS	60 DAS	At harvest
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	61.87	133.99	189.80
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	58.33	140.69	185.40
T_3	5 Kg Zn ha^{-1} soil application	60.50	142.23	187.50
T_4	2 Kg B ha^{-1} soil application	62.42	135.96	174.20
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	65.38	151.58	199.80
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	63.12	153.12	201.80
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	61.77	149.93	197.60
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	61.31	132.34	187.60
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	63.77	141.46	186.50
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	67.83	159.94	210.80
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	60.33	154.55	203.70
T_{12}	Water spray at the time of PGR application	61.55	127.16	162.60
	SEm±	2.33	6.40	8.15
	CD at 5%	NS	18.77	23.90

The data presented in Table-3. The leaf: stem ratio was found non significant at the time of harvest and the maximum leaf stem ratio (0.74) was found with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm and minimum leaf stem ratio (0.69) observed in 2 Kg B ha^{-1} and water spray at the time of PGR application.

Table 3: Effect of PGR and Micronutrients (Zn & B) on Leaf stem ratio of fodder sorghum

S. No.	Treatments	Leaf stem ratio
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	0.70
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	0.69
T_3	5 Kg Zn ha^{-1} soil application	0.71
T_4	2 Kg B ha^{-1} soil application	0.69
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	0.72
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.73
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.71
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.70
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.69
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.74
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.73
T_{12}	Water spray at the time of PGR application	0.69
	SEm±	0.02
	CD at 5%	NS

Leaf area index computed at various growth stages are presented in Table 4, Leaf area index was found significant at all the stage of crop growth except 30 DAS. At 60 DAS and at harvest stage the maximum leaf: stem ratio (2.98, 3.80) was observed in 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray at par with T_7, T_8, T_9 and T_{11}, respectively, and observed minimum (2.02, 3.05) in water spray at the time of PGR application respectively are significant over them.

The variation in leaf stem ratio is due to the Zn and salicylic acid which help in the biosynthesis of auxin that promotes the growth of plant and also increase the leaf area index. Similar result was also presented by Youssef *et al*. (2017) [12].

Table 4: Effect of PGR and micronutrients (Zn and B) on leaf area index at different growth stages of fodder sorghum

S. No.	Treatments	Leaf area index		
		30 DAS	60 DAS	At harvest
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	0.89	2.45	3.22
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	0.92	2.31	3.16
T_3	5 Kg Zn ha^{-1} soil application	0.89	2.14	3.23
T_4	2 Kg B ha^{-1} soil application	0.91	2.50	3.48
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	0.93	2.48	3.60
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.81	2.48	3.50
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.84	2.74	3.23
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.87	2.63	3.37
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.85	2.97	3.40
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	0.95	2.98	3.80
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	0.92	2.68	3.26
T_{12}	Water spray at the time of PGR application	0.82	2.02	3.05
	SEm±	0.039	0.112	40.30
	CD at 5%	NS	0.329	3.22

Yield attributes

Green and dry fodder yield (q ha^{-1})

The data presented in Table-5. The green and dry fodder yield of fodder sorghum as influenced by plant growth regulators and micronutrients was found significant. Maximum green fodder yield (564.75 q ha^{-1}) was recorded with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm and at par with T_1, T_3, T_5, T_6, T_7, and T_{11} which produce 528.93, 523.90, 538.40, 547.10, 529.65, 546.50, q ha^{-1} respectively, and recorded minimum yield (456.60 q ha^{-1}) in water spray at the time of PGR application.

Maximum dry fodder yield (156.44 q ha^{-1}) was recorded with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm and at par with T_1, T_3, T_5, T_6, T_7, and T_{11} which produce 146.51, 145.12, 149.14, 151.54, 146.70, 151.38, q ha^{-1} respectively, and observed minimum yield (128.50 q ha^{-1}) in water spray at the time of PGR application.

Maximum yield was recorded due to the PGR, that helps Zn and B mobilization process in the plant and also enhance the translocation of these nutrients in plant resulting increase in photosynthates that increase the yield of plant by cell division, cell elongation and converting more food from source to sink that maximize the yield of crop. Similar results also be proposed by Pal *et al.* (2009) [13].

Table 5: Effect of PGR and micronutrients (Zn and B) on Green and dry fodder yields of fodder sorghum

S. No.	Treatments	Green fodder yield (q ha^{-1})	Dry fodder yield (q ha^{-1})
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	528.93	146.51
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	501.20	138.82
T_3	5 Kg Zn ha^{-1} soil application	523.90	145.12
T_4	2 Kg B ha^{-1} soil application	499.56	138.38
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	538.40	149.14
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	547.10	151.54
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	529.65	146.70
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	510.97	141.54
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	504.42	139.72
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	564.75	156.44
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	546.50	151.38
T_{12}	Water spray at the time of PGR application	465.60	128.50
	SEm±	17.41	4.38
	CD at 5%	51.06	12.84

Quality

Crude Protein content (%) and yield (q ha^{-1}):

Crude Protein content (%) and yield (q ha^{-1}) presented in Table- 6. The data on crude protein content was found non significant as influenced by PGR and Zn and B. Yield of crude protein was found significant as influenced by PGR and Zn and B. maximum crude protein yield (11.77 q ha^{-1}) was found with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm at par with T_1, T_5, T_7 and T_{11}, and recorded minimum crude protein yield (8.90 q ha^{-1}) in water spray at the time of PGR application.

Maximizing the yield due to the application of B in the plant, B helps the synthesis of protein by plant which maximize the protein yield. Similar result also described by Salem (2020) [14].

Table 6: Effect of PGR and micronutrients (Zn and B) on Crude protein content (%) and yield (q ha^{-1}) at harvest stage of fodder sorghum

S. No.	Treatments	Crude protein content (%)	Crude protein yield (q ha^{-1})
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	7.24	10.60
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	6.94	9.63
T_3	5 Kg Zn ha^{-1} soil application	7.08	10.27
T_4	2 Kg B ha^{-1} soil application	6.95	9.61
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	7.25	10.81
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	7.33	11.10
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	7.18	10.53
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	7.08	10.02
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	6.95	9.71
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	7.53	11.77
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	7.34	11.11
T_{12}	Water spray at the time of PGR application	6.93	8.90
	SEm±	0.25	0.46
	CD at 5%	NS	1.35

ADF and NDF content (%) and yield (q ha^{-1})

ADF content and NDF content computed at harvest stages are presented in Table 7, indicate that ADF and NDF content as influenced by PGR and micronutrients (Zn and B) in fodder sorghum.

The data on ADF and NDF content were found non significant as influenced by PGR and Zn and B. Yield of ADF and NDF showed significant variation as influenced by PGR and Zn and B. maximum ADF yield (65.32 q ha^{-1}) and NDF (100.93 q ha^{-1}) recorded with application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray at par with rest of the treatment was significant and while minimum ADF yield (47.67 q ha^{-1}) and NDF (77.74 q ha^{-1}) observed with application of water spray at the time of PGR application.

Table 7: Effect of PGR and micronutrients (Zn and B) on ADF and NDF content (%) and yield (q ha^{-1}) at harvest stage of fodder sorghum

S. No	Treatments	ADF content (%)	ADF yield (q ha^{-1})	NDF content (%)	NDF yield (q ha^{-1})
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	40.25	58.97	62.81	92.02
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	37.59	52.18	60.75	84.33
T_3	5 Kg Zn ha^{-1} soil application	39.45	57.24	62.26	90.35
T_4	2 Kg B ha^{-1} soil application	37.68	52.14	60.8	84.13
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	41.10	61.29	63.21	94.27
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	41.46	62.82	63.57	96.33
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	40.10	58.82	62.41	91.55
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	39.50	55.90	62.16	87.98
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	38.30	53.51	61.10	85.36
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	41.76	65.32	64.52	100.93
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	41.50	62.82	63.67	96.38
T_{12}	Water spray at the time of PGR application	37.10	47.67	60.50	77.74
	SEm±	1.76	1.39	2.21	2.91
	CD at 5%	NS	4.08	NS	8.55

Zn and B contents (ppm) in plant

The data computed that Zn and B content as influenced by PGR and micronutrients (Zn and B) presented in table 8, the data revealed that Zn and Boron content in plant was found non-significant.

Maximum Zn and B (18.65) and (139.2) was found with the application of 5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} + Triacontanol 10 ppm and minimum Zn and B (17.95) and (137.7) in Water spray at the time of PGR application.

Table 8: Effect of PGR and micronutrients (Zn and B) on Zn and B content in plant after harvest of fodder sorghum

S. No.	Treatments	Zn contents (ppm)	B contents (ppm)
T_1	Triacontanol 10 ppm at 30 DAS (Foliar spray)	17.95	135.00
T_2	Salicylic acid 100 ppm at 30 DAS (foliar spray)	17.98	135.20
T_3	5 Kg Zn ha^{-1} soil application	18.50	136.10
T_4	2 Kg B ha^{-1} soil application	18.25	138.30
T_5	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application	18.60	138.80
T_6	5 Kg Zn ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	18.50	135.70
T_7	5 Kg Zn soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	18.55	135.90
T_8	2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	18.30	138.90
T_9	2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	18.35	139.00
T_{10}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Triacontanol 10 ppm at 30 DAS foliar spray	18.65	139.20
T_{11}	5 Kg Zn ha^{-1} + 2 Kg B ha^{-1} soil application + Salicylic acid 100 ppm at 30 DAS foliar spray	18.64	139.40
T_{12}	Water spray at the time of PGR application	17.95	137.70
	SEm±	0.61	4.23
	CD at 5%	NS	NS

Reference

1. Balole TV, Legwaila GM. *Sorghum bicolor* (L.) Moench. Record from Protabase. Brink, M. & Belay, G. (Editors). PROTA (Plant Resources of Tropical Africa / Ressourcesvégétales de l'Afriquetropicale), Wageningen, Netherlands 2006. http://www.prota4u.org
2. Conn EE. Cyanogenic compounds. Annu. Rev. Plant Physiol 1980;31:433-451.
3. Gunes A, Inal A, Alpaslan M, Cicek N, Guneri E, Eraslan F *et al*. Effects of exogenously applied salicylic acid on the induction of multiple stress tolerance and mineral nutrition in maize (*Zea mays* L.). Archives of Agronomy and Soil Science 2007;51(6):687-695.
4. Harada H, Yoshimura Y, Sunaga Y, Hatanaka T. Variations in nitrogen uptake and nitrate-nitrogen concentration among sorghum groups. Soil Sci. Plant Nutr 2000;46(1):97-104
5. Koeppen K, Reinhardt G, Gaertner S. Assessment of energy and greenhouse gas inventories of sweet sorghum for first and second generation bioethanol. FAO Environmental and Natural Resources Service Series, 2009, 30.
6. Kojima M, Poulton JE, Thayer SS, Conn EE. Tissue distribution of dhurrin and of enzymes involved in its metabolism in leaves of Sorghum bicolor. Plant Physiol 1979;63:1022-1028.
7. Pal D, Mallick S, Ghosh RK, Pal P, Tzudir L, Barui K. Efficacy of *Triacontano*l on the growth and yield of rice crop in inceptisol of West Bengal Journal of Crop and Weed 2009;5(2):128-130.
8. Pal MS. Prospects of forage based crop diversification. National group meet (*kharif)* of AICRP on forage crops & utilization SKUAST-K, Srinagar 2016, 110-115.
9. Rashid A, Akhtar ME. Soil fertility research and balanced nutrient management in Pakistan. Proc. Symposium on Balanced Fertilizer use: impact on Crop Production, Islamabad 2006.
10. Rattunde HFW, Zerbini E, Chandra S, Flower DJ. Stover quality of dual-purpose sorghums: genetic and environmental sources of variation. Field Crops Res 2001;71(1):1-8.
11. Reddy BVS, Ramesh S, Reddy PS. Sorghum breeding research at ICRISAT Goals, Strategies, Methods and Accomplishments. Int. Sorghum Millets Newsletter 2004;45:5-12.
12. Salem EMM. Cooperative effect of salicylic acid and boron on the productivity of pearl millet crop under the degraded saline soils conditions, Egypt. J Agron

2020;42(2):185-195.
13. Youssef RA, Azab MEEl, Mahdy HAA, Essa EM, Mohammed KAS. Effect of salicylic acid on growth, yield, nutritional status and physiological properties of sunflower plant under salinity stress, International Journal of Pharmaceutical and Phytopharmacological Research 2017;7(5):54-58.
14. Yuan JS, Tiller KH, Al-Ahmad H, Stewart NR, Stewart Jr. CN. Plants to power: bioenergy to fuel the future. Trends in Plant Science 2008;13:421- 429.