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RESEARCH ARTICLE

EFFECT OF SPACING AND FERTILIZERS DOSES ON HCN CONTENT OF MULTICUT FORAGE SORGHUM (SPV 2242) UNDER IRRIGATED CONDITION

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ABSTRACT

A field experiment was conducted to find out the effect of spacing and fertilizer doses on HCN content of multi-cut forage sorghum at TNAU, Coimbatore during *Kharif*, 2016. The experiment was laid out in split plot design replicated thrice using SPV2242 as the test variety. The treatments consisted of four different spacings (30 x 10 cm, 30 x 15 cm, 30 x 20 cm and 30 x 25 cm) along with three fertilizer doses (75% RDF, 100% RDF and 125% RDF). In addition, recommended application of FYM @ 25 t/ha was followed. The lower HCN content was recorded in 30 x 10 cm spacing (83.7, 79.6 and 77.4 ppm at first, second and third cut, respectively). With regard to fertilizers, application of 75% RDF recordedthe lower HCN content (110.8, 100.2 and 91.7 ppm) at first, second and third cut of multicut forage sorghum. The results revealed that increased plant populationwith lowest rate of fertilizer application decreases the HCN content of multicut forage sorghum and it improves the fodder quality.

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INTRODUCTION

Global trend in animal production indicates a rapid increase in the consumption of livestock products. India supports nearly 20 per cent of the world livestock population on a land area of only 2.3 per cent. It is a leader in cattle (16 per cent) and buffalo (55 per cent) population and has world's second largest goat (20 per cent) and fourth largest sheep (5 per cent) population, respectively. But the present fodder availability is not met with the feed requirement of animal production. Sorghum is considered to be a good feed in ordinary conditions but when it's normal growth is constrained by drought (Fjell *et al*., 1991), or imbalanced soil nutrients, hydrocyanic acid (HCN) content may develop to such an extent that the toxic level may reach lethal level when fed to animals. Cyanide occurs in the leaves of sorghum as cyanogenic glucosidedhurrin. Degradation of dhurrin yields equimolar amount of hydrocyanic, glucose and P-hydroxybenzaldehyde (P-HB). During the environmental stress and when leaf tissues are cracked large amount of dhurrin may be produced rapidly. It is observed that when HCN is readily absorbed into the blood stream of grazing ruminants, it causes cellular asphyxiation leading to illness of cattle eventually resulting in the death of animals and even at doses as little as 0.5 g aresufficient to kill a cow. The safe limit of HCN in green forage for livestock is 500 ppm on fresh weight basis and 200 ppm on dry weight basis. Hydrocyanic acid content is heritable and subjected to modification through selection and breeding, as well as by climate, stage of maturity, stunting of plant, type of soil, fertilizer and crop management. Nitrogen application is considered to be essential for growth and regrowth during growing season. However, higher level of nitrogen application may increase prussic acid contents of forage sorghum and ultimately poisoning to animals. The farmers are generally not familiar with the optimum growth stage of forage sorghum that should be fed to the livestock. They apply either over or under dose of nitrogen fertilizer to get the higher forage yield of sorghum and harvest at any growth stage without having the knowledge of HCN poisoning and its relation with these practices. Different varieties of sorghum develop varying levels of HCN when grown under different environmental conditions. High nitrogen fertilization also leads to increased HCN poisoning in forage sorghum. Hence, it was felt necessary to optimize the dose of fertilizer and spacing on the effect of HCN content of forage sorghum.

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MATERIALS AND METHODS

The experiment was conducted at, Tamil Nadu Agricultural University, Coimbatore during *Kharif* 2016. The experiment was laid out in split plot design having three replications. The

study area is geographically situated at 11˚N latitude and 77˚E longitude with an altitude of 426.7 m above mean sea level. The pH and EC of the soil was 8.01 0.32 dSm^{-1}, respectively. The net plot size of 5.0 x 2.4 m was used. The experiment comprised of four different spacing along with three different fertilizer doses *viz.,* 30 x 10 cm, 30 x 15 cm, 30 x 20 cm, 30 x 25 cm and 75% RDF, 100% RDF and 125% RDF. The variety used was SPV 2242. The seeds were sowed depending upon the treatment spacings and the recommended doses of N, P_2O_5, and K_2O kg/ha were applied as per the treatments. Fifty percent of the recommended dose of nitrogen and full dose of P_2O_5 and K_2O were applied at the time of sowing. Remaining fifty percent dose of nitrogen was top dressed at 30 DAS. After each cut of 45 kg N/ha was applied. The HCN content was analysed in the laboratory by Hogg and Ahlgren, 1942 (Gomez and Gomez, 1984) method at 65 DAS, 45 DAFH and 45 DASHin multicut forage sorghum.Data were statistically analysed using "Analysis of variance test". The critical difference at 5% level of significance was calculated to find out the significance of different treatments over each other (Hogg and Ahlgren, 1942).

RESULTS AND DISCUSSION

HCN Content

The cyanogenic glycoside, dhurrin found in sorghum can be hydrolysed in the rumen and liberate deadly hydrocyanic acid. Hydrocyanic acid content in excess of 500 ppm (on wet weight basis) in the forage sorghum is toxic to the animal health.

Table 1. Effect of spacings and fertilizer doses on HCN content (ppm) at first, second and third cut

	HCN content (ppm)		
Treatments	**65 DAS**	**45 DAFH**	**45 DASH**
Spacing			
M_1 (30 x 10 cm)	83.7	79.6	77.4
M_2 (30 x 15 cm)	110.1	99.1	89.5
M_3 (30 x 20 cm)	127.1	115.8	100.2
M_4 (30 x 25 cm)	157.0	129.2	119.4
SEd	4.4	4.3	3.3
CD (P=0.05)	10.8	10.5	8.1
Fertilizer doses			
F_1 (75% RDF)	95.8	100.2	91.7
F_2 (100% RDF)	104.9	105.2	95.7
F_3 (125% RDF)	112.7	112.4	102.5
SEd	2.5	1.8	2.1
CD (P=0.05)	5.3	3.8	4.4
Interaction (MXF)			
SEd	6.0	5.2	4.7
CD (P=0.05)	NS	NS	NS

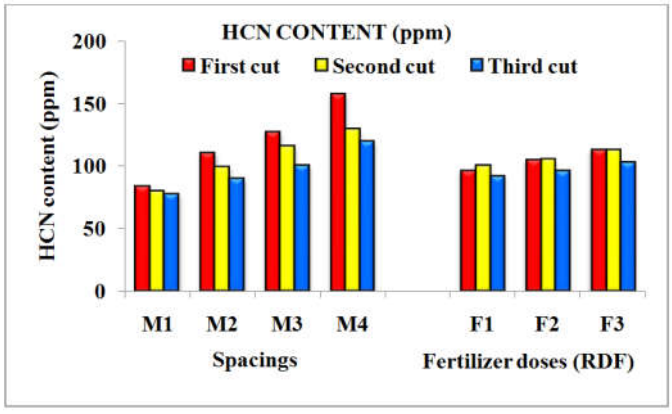

Figure 1. Effect of Spacings and fertilizer doses on HCN content (ppm) of multi-cut forage sorghum - first, second and third cut

1a. Saturated picrate paper kept overnight for colour development

1b. Colour development after reaction with HCN evolved

1c. Assessing colour development with spectrophotometer

Plate 1.HCN Analysis

The HCN content of all the varieties increased with increased level of nitrogen which indicated that nitrogen played a dominating role in HCN synthesis (Shaikh and Zende, 1971). The effect of spacings and fertilizer doses on HCN content (ppm) at first, second and third cut was presented in Table 1. The HCN content was statistically significant with the spacing of 30 x 10 cm at first, second and third cut of forage sorghum. Lower HCN content was observed with the spacing of 30 x 10 cm (83.7, 79.6 and 77.4 ppm at first, second and third cut, respectively). With regard to fertilizer doses, 75% RDF recorded the lower HCN content (110.8, 100.2 and 91.7 ppm) at first, second and third cut of multicut forage sorghum. This might be due to enzyme activity which gradually decreased at 50% flowering stage. This is supported by the findings of (Kumar and Devender, 2010). The HCN content decreased with decreased soil nitrogen availability which decreased nitrogen uptake that leads to lower HCN content of forage sorghum and decreased with the advancing age of the crop.It was shown in Figure 1. The HCN content progressively decreased during the second and third cut of forage sorghum at harvesting stage.HCN content was significantly decreased in subsequent ratooning of forage sorghum. This might be due to lower dose of fertilizer application (45 kg N/ha at each cut only).

Conclusion

It could be concluded that increased plant population (30 x 10 cm spacing) with lowest rate of fertilizer application (75% RDF) decreases the HCN content of multicut forage sorghum and it improves the fodder quality.

REFERENCES

Fjell, D., B. Dale and T. Gene. 1991. Nitrate and prussic acid toxicity in forage causes, prevention and feeding management, Cooperative extension service, Kansas state university, Manhattan, Kansas, USA, pp. 1–4.

Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research. II[ed]., John Wiley and Sons, New York. P- 381.

Hogg P.G. and H.L. Ahlgren. 1942. A rapid method for determining hydrocyanic acid content of single plant of sudan grass. *J. American Soc. Agron.,* 34: 199-200.

Kumar, C.V. and V. Devender. 2010. Effect of plant age at harvest and season on the hydrocyanic acid potential of some sorghum cultivars. *Indian J. Anim. Nutr.,* 27: 142-146

Shaikh, G.A., and G.K. Zende. 1971. Effect of N, P and K fertilisers on the HCN content of sorghum. *Indian J. Agric. Sci.,* 41(5):456-460.

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