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Research Paper

Soluble oxalate content accumulation and yield of certain Hybrid Bajra Napier genotypes during summer and their influence on animal diet

K. MURALI KRISHNA AND S. RIAZUDDIN AHMED

See end of the article for authors' affiliations

Correspondence to :

K. MURALI KRISHNA,
Maize Research Centre, ARI, A.N.GR. Agricultural University, Rajendranagar, HYDERABAD (A.P.) INDIA

ABSTRACT

Fourteen hybrids of Bajra Napier genotypes were analysed for water soluble oxalate content and yield at 40th and 80th day of harvestings. Oxalate content decreased with delayed harvest (80th Day) compared to early harvest (40th day); however, it ranged between 2 – 3 % in all the hybrid genotypes which is under permissible tolerance limits. APBN-1 and PBN-91 are emerging as the promising genotypes with respect to oxalate and biomass production than the standard checks at 40th day of harvest.

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Key words : Annual increment, DBH, Dryland, Tree species

INTRODUCTION

In Andhra Pradesh only two per cent of cultivable area is used for fodder production. As per the 1993 census, the fodder availability is 247 MTas against the requirement of 632 MT showing a deficit of 60 per cent to meet the demand of the livestock sector (Out line of Agriculture situation in A.P. 1993). The development of Pusa Giant Napier grass (PGN), a hybrid genotype between Bajra' (*Pennisetum typhoides*) and Napier or Elephant grass (*Pennisetum purpureum*), at the IARI, New Delhi, could be considered as a major break through in fodder production. With high yields of 2500-3000 quintals/hectare/ year of green matter under irrigated conditions, it has established itself throughout the country.

The oxalate context of fodder grasses is of great importance as it is known to be highly toxic to grazing animals.

The occurrence of carbonate calculi in the urinary tract of cattle ingesting such grasses is associated with high oxalic acid (Lal *et al.,* 1966). There were certain apprehensions prevailing in some quarters that the PGN has high oxalate content and as such, it was not found to be a very suitable fodder. The present investigations were, therefore, undertaken on certain hybrid bajra napier cultivars to obtain information on oxalate content and yield aspects at 40th and 80th day of harvesting.

MATERIALS AND METHODS

The experimental materials consisted of fourteen diverse genotypes of hybrid bajra napiers which were evaluated during summer, 1995 at Livestock Research Institute, Rajendranagar, Hyderabad, Andhra Pradesh. The genotypes were space planted with root slips, adapting 50 x 50 cm spacing in a Randomized Block Design with three replications. Recommended package of practices to raise healthy crop were followed. Observations were recorded on five competive plants selected randomly per each genotype per each replication. First harvest was done at 40th day after planting (early harvest) and second harvest was done at 80th day after planting (late harvest). Water soluble oxalates were estimated by following Abaza *et al.* (1967) method and was expressed in percentage. Further, yield was estimated by Dewey and Lu (1959). Calcium content in fodder of these genotypes was determined by adopting standard procedures laid out Tandon (1993). A ratio between calcium and water soluble

oxalate content was computed in all genotypes at both harvest stages.

RESULTS AND DISCUSSION

Fodder yield recorded at 40th and 80th day by different genotypes, water soluble oxalate content and calcium to oxalate content are represented in Tables 1 and 2 , respectively. Yield data revealed that highest fodder yield was recorded by APBN-1 genotype closely followed by genotype PBN-91 at 40th day of harvest and NB-21 genotype recorded highest at 80th day of harvest. However, it was closely followed by APBN-1 and PBN-91. Lowest fodder yield was recorded by BN-9202 genotype at both times of harvest.

Water soluble oxalate content record showed that it ranged between 1.12 to 2.80% and 0.86 to1.97% with mean values of 1.96 and 1.415% at 40th and 80th day of harvesting, respectively. Highest Water soluble oxalate content was recorded by NB-21 and BN-9201 genotypes at 40th and CN-46 and NB-21 at 80th day of harvesting, respectively. It was observed that IGFRI-7 and BN-9201 genotypes recorded lowest values at 40th and 80th day of harvesting, respectively.

Table 1 : The water soluble oxalate content and yield data of certain hybrid bajra napiers at 40th day of harvest

Sr. No.	Hybrid	Oxalates (%)	Calcium : oxalates	Yield (kg/ha)
1.	BN-88-13.1	1.96 L	0.23:1.96	0.67 L
2.	NB-21	2.80 H	0.33:2.80	0.85 H
3.	APBN-1	2.25 H	0.27:2.25	1.30 H (1)
4.	BN-9202	1.99 M	0.23:1.99	0.24 L
5.	BH-2	2.16 H	0.25:2.16	0.44 L
6.	CN-46	2.25 H	0.27:2.25	0.81 H
7.	CN-48	2.20 H	0.26:2.20	0.62 L
8.	CN-76	1.68 L	0.20:1.68	0.74 M
9.	PBN-89	2.24 H	0.26:2.24	0.91 H
10.	PBN-90	1.75 L	0.21:1.75	0.97 H
11.	PBN-91	1.81 L	0.21:1.81	1.09 H (2)
12.	BN-9201	2.53 H	0.30:2.53	0.42 L
13.	BN-9203	1.97 L	0.23:1.97	0.57 L
14.	IGFRI-7	1.12 L	0.13:1.12	0.84 H
	Grand mean	2.06	-	0.75
	C.D.	0.08	-	0.03

Table 2. The water soluble oxalate content and yield data of certain hybrid bajra napiers at 80th day of harvest

Sr. No.	Hybrid	Oxalates	Calcium : Oxalates	Yield (kg/ha)
1.	BN-88-13.1	1.68 H	0.20:1.68	1.27 H
2.	NB-21	1.94 H	0.23:1.94	1.57 H
3.	APBN-1	1.41 M	0.16:1.41	1.54 H
4.	BN-9202	1.15 L	0.13:1.15	0.44 L
5.	BH-2	1.13 L	0.13:1.13	0.46 L
6.	CN-46	1.97 H	0.23:1.97	0.94 L
7.	CN-48	1.44 H	0.17:1.44	0.89 L
8.	CN-76	1.67 H	0.20:1.67	0.92 L
9.	PBN-89	1.43 H	0.17:1.43	1.25 H
10.	PBN-90	1.15 H	0.13:1.15	1.34 H
11.	PBN-91	1.14 L	0.13:1.14	1.36 H
12.	BN-9201	0.86 L	0.10:0.86	0.74 L
13.	BN-9203	1.14 L	0.13:1.14	0.83 L
14.	IGFRI-7	1.12 L	0.13:1.12	1.14 H
	Grand mean	1.377	-	1.05
	C.D.	0.05	-	0.02

With regard to ratio between calcium and water soluble oxalate contents, it was noticed that NB-21 and CN-46 genotypes recorded highest ratio of 0.33:2.80 and 0.23:1.97 at 40th and 80th day of harvesting, respectively. As per the earlier researchers *viz*., Kipnis and Dabush (1990) the highest total and soluble oxalate contents in the dry matter of field grown plants were 2·6 % and 1·3%, respectively.

The importance of calcium in the diet of grazing animals is crucial. When coupled with phosphorus, the two minerals compose up to 70% of the total mineral content in the body. Calcium is necessary for skeletal, cardiac, and smooth muscle function, nerve conduction, and a host of other metabolic reactions. Ensuring adequate calcium intake is imperative, but substances like calcium oxalates which can impede proper absorption of calcium. Oxalates (strong acid compounds found in some plants) are such villains. Oxalates bind calcium in the gastrointestinal tract of the grazing animals, thereby prohibiting its uptake into the bloodstream and its subsequent use throughout the body. As calcium levels in the blood drop, hormones initiate resorption(restoration) of calcium from the skeleton. This reallocation of calcium allows the muscular and nervous systems to function unhampered but only at the considerable expense of the skeletal system. Ingestion of these plants is typically not an issue unless they represent a large fraction of available forage or if oxalate-laden plants are more palatable than other species in the pasture landscape. The concentration of oxalates in plants often rests on the climatic conditions and soil chemistry. Oxalates become more toxic as plants mature. In summer pastures, oxalate concentration may rise as calcium levels subside (Hintz *et al*. (1984) and Lewis, 1996.)

The safety of a diet known to contain oxalates depends on the calcium to oxalate ratio. A diet that has a ratio of 0.5:1 or greater is generally regarded as safe. Kikuyu, buffel, pangola, and green panic grasses, for example, have been reported to have calcium to oxalate ratios of 0.23:1, 0.22:1. 0.37:1, and 0.32:1, respectively, indicating all are potentially dangerous. A second way of determining safety of certain grasses is by calculating percentage of oxalate in the dry matter of a diet. Total oxalate intake should not exceed 0.5% of dry matter as reported by Hintz *et.al*., (1984) and Lewis, L. D. 1996.

Conclusion:

Oxalate content decreased with delayed harvest (80th Day) compared to early harvest (40th day); however, it ranged between 2 – 3 % in all the hybrid genotypes which is under permissible tolerance limits. APBN-1 and PBN-91 are emerging as the promising genotypes with respect to oxalate and biomass production than the standard checks at 40th day of harvest. So, adoptions of these hybrids are recommended for the benefit of the farmer.

Authors' affiliations:
S. RIAZUDDIN AHMED, Maize Research Centre, ARI, A.N.GR. Agricultural University, Rajendranagar, HYDERABAD (A.P.) INDIA

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