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UTILITY OF GROWTH PARAMETERS AS INDICES OF RESURGENCE POTENTIAL IN FORAGE SORGHUM GENOTYPES.

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ABSTRACT

The study revealed that the growth parameters, regrowth rate and utilization ratio were successful indices to asses the regenerative ability of the ratoon crop during the early stages of growth. The regrowth utilization ratio was related to the ultimate yield of the crop.

KEY WORDS : *Growth parameter, Resurgence, Ratoonability*

INTRODUCTION

Ratooning offers prospects of economically increasing the yield from unit land area at lower cost. The success of the ratoon crop depends on the ratoonability of the cultivars. This in turn depends on the innate ability of the emerging crop to regrow utilising the reserve materials in the underground storage tissues (Hsiao, 1973). It has been reported by Hirose (1973) that the new growth results from the energy supplied by the reserve organs. Hence, an experiment was conducted to clarify the effect of the reserve substances contained in the stubbles on the ratoon growth of sorghum. The parameters as suggested by Ehara (1965), viz., regrowth rate, utilization ratio and regrowth utilization ratio were studied for the purpose.

MATERIALS AND METHODS

Five genotypes of sorghum, which varied in yield and duration were chosen. viz. K 7, Co 11, FS 1, SSG 59-3 and TNS 27. The experiment was laid out in a randomised block design, with five replications. The spacing adopted was 30cm x 10 cm. For the sown crop, a basal application of 30 N, 40 P_2O_5 and 2OK_2O Kg/ha. was applied and 30 Kg/ha. N was given as top dressing. At 50% flowering, the plants were cut at a height of 15 cm. from the ground level 50 to 60 days after sowing. For the ratoon crop 30 Kg/ha. N was added immediately after cutting. A composite sample of fifteen plants was collected from each genotype at the time of cutting and once in every ten days starting from the 20th day of cutting. The collected sample consisting of the roots and stubbles along with the new shoots were

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oven-dried to constant weight and from the dry weight, the regrowth rate, utilization ratio and regrowth utilization ratio were arrived at.

Regrowth rate: This value indicates the amount of top regrowth in a given period from the stubbles.

$$\text{Regrowth Rate (RgR)} = \frac{\text{Dry matter of top regrown in a given period}}{\text{Dry matter of top and roots immediately after cutting}} \times 100$$

Utilization Ratio - The Utilization ratio gives the percentage of dry matter utilized for regrowth from the existing roots and stubbles.

$$\text{Utilization Ratio (UR)} = \frac{\text{Dry matter of top and roots reduced by regrowth}}{\text{Dry matter of top and roots immediately}} \times 100$$

Regrowth Utilization Ratio : This ratio demonstrates the quantum of dry matter consumed in relation to top regrowth.

$$\text{Regrowth Utilization Ratio} = \frac{\text{Dry matter of top regrown}}{\text{Dry matter of top and roots reduced by regrowth}} \times 100$$

RESULTS AND DISCUSSION

Regrowth Rate:

The regrowth rate increased steadily and varied among cultivars (Table I). It gave a reliable value at the early stages of growth but as growth proceeded the influence of the photosynthates was not clearly brought out in this. Initially Rgr was maximum for the variety FSI which had a grater recovery rate and low mortality which was due to the high TSS content of the variety (Table I)(Takasaki et al)(1981). A significant difference among varieties snowed the genotypic difference in the ability of the varieties to utilize the reserve materials for regrowth. Once the photosynthetic syrface was available, the grwoth got stabilized and no significant difference among varieties was observed.

Table.I. Regrowth Rate (per cent) of forage sorghum genotypes

Cultivar	Days after cutting					Total soluble solids (Brix)
	20	30	40	50	60	
K7	5.95	38.97	90.25	234.22	375.34	6.5
CO 11	3.72	24.09	60.73	185.59	248.59	5.5
FS I	8.18	31.81	60.44	158.74	298.74	8.0
SSG 59-3	4.51	31.23	78.78	170.41	-	6.0
TNS 27	2.63	45.40	66.63	202.51	314.87	3.5
CD at 5%	1.49	NS	NS	NS	69.70	

Table.II. Utilization ratio (per cent) of forage sorghum genotypes

Cultivars	Days after cutting				
	20	30	40	50	60
K 7	72.74	53.76	28.65	-19.45	-28.14
Co 11	48.75	42.66	34.50	19.52	-9.63
FSI	60.67	47.75	26.14	-15.66	-26.54
SSG 59.3	57.61	56.63	-14.08	-51.54	-
TNS27	63.24	55.93	23.73	-9.98	-12.18
CD at 5%	8.34	15.44	NS	NS	21.90

NS = Not Significant.

Utilization Ratio

This value was higher in the initial stages which showed the lack of photosynthetic surface. Once the plants acquired self sustinance efficiency, the utilization from the reserves ceases and thereafter a further downward translocation of food materials to the roots and stubbles may also be anticipated which contributes for the negative value (Table II), this in turn helped to explain the low per plant yield observed in the variety Co 11 even with high regrowth rate the translocation to the reserve organs was very low and also it was observed only on the 60th day nearing harvest.

Regrowth Utilization Ratio

This ratio was also significant only during the early stages of growth (Table III). Here the amount of dry matter utilized from the stubbles became con-

Table III. Regrowth.Utilization ratio of forage sorghum genotypes

Cultivers	Days after cutting				
	20	30	40	50	60
K 7	5.10	80.10	364.00	-1291.60	-3012.80
Co 11	14.10	49.30	183.90	1318.60	-2597.80
FSI	14.20	72.50	331.40	-1058.10	-1084.80
SSG 59.3	6.40	44.00	-462.20	-281.20	-
TNS 27	3.00	49.20	426.50	1629.90	-3514.20
CD at 5%	3.96	NS	325.58	NS	NS

NS = Not Significant.

Table IV. Integration of growth attributes on the genotypes and stages

Cultivars	Regrowth Rate	Utilization Ratio	Regrowth utilization Ratio
K 7	84.90	33.51	-435.23
Co 11	92.39	33.00	-391.53
FSI	20.08	26.91	-159.99
SSG 59-3	22.90	25.66	-173.23
TNS 27	24.93	28.58	-285.28
Significance			
CD	31.17	NS	NS
Stags 20	5.00	59.19	8.61
30	34.30	52.77	61.07
40	71.37	25.42	168.72
50	190.37	24.35	-71.81
Significance			
CD	31.17	6.76	NS

stant or obsoletely nil after a certain stage of growth, but at the same time top regrowth continued by utilizing the photosynthates supplied by the leaves or till it attained the potential for manufacturing its own food, thereafter, the dependence on the reserves declined progressively and at a latter stage the

Table V. Comparison of growth parameters (Per cent) with the per plant yield (g.plant^{-1}).

Variety	Regrowth Rate	Utilization Ratio	Regrowth Utilization Ratio	Per plant yield
K 7	375.34	-28.14	-3012.80	42.38
CO 11	248.59	-9.63	-2597.80	28.62
FSI	298.74	-26.54	-1084.80	24.02
SSG 59-3.	170.41	-51.54	-281.20	23.76
TNS 27	314.87	-12.18	-3514.20	48.72

regrowth utilization ratio appeared to be a function of top growth and the total dry mater accumulated. Hence, this factor alone showed relevance to the ultimate yield of the crop at latter stages (Table V).

The pooled analysis with these three parameters lead to the conclusion that significant variation exists in the regrowth rate and utilization ratio at different stages of growth (Table IV).It also revealed that regrowth rate is lower at the earlier stages of growth while the utilization ratio is higher which substantiated the earlier observation. The regrowth utilization ratio did not show a significant variation among stages, it showed a steady increase in the top growth as compared to the reduction in root weight, but later on it attained a negative value which revealed the backward transmission of carbohydrates produced in the shoots to the roots and stubbles from the 50th day onwards.

In conclusion it was found that regrowth rate and utilization ratio were relevant only during the initial stages of growth. Regrowth utilization ratio was the only factor for comparison of the total yield of the crop. The regrowth rate and regrowth utilization ratio of varieties FSI and Co 11 were found to be better, yet the ultimate yield of the crop was not an expression of these factors, this leads to the conclusion that though FSI and Co II have put forth more regrowth with less utilization of reserves, their efficiency was found to be less. These factors require further in depth study. The use of isotopes and further detailed study of the hormonal factors involved might help to unravel the mystery further.

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