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The Relationship of Sheath Moisture with Pol in Some Selected Sugarcane Clones

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ABSTRACT

An investigation was conducted with four selected sugarcane clones in order to determine the relationship of sheath moisture with pol during the maturity phase of the crop. Significant negative correlations between sheath moisture and pol were obtained in all the clones tested (Isd-16, r=-0.756 ; I-60/74, r=-0.781 ; Isd-2/54, r=-0.867 and L. Jaba-C, r=-0.924). Data revealed that Isd-16 had very low sheath moisture values during January (54.79%) and February (52.01%) compared to the theoretical optimum range of 71 to 73% for maximum yield of recoverable sugar. Maintaining sheath moisture to the desired level by applying irrigation offers scope for obtaining higher sugar yield from clones undergoing drying - off during the harvest season.

INTRODUCTION

Researches on sugarcane maturity and repening in recent years have strived to find out how to obtain higher sugar yields with good quality of juices at harvest. Wolters (1931) and Lennox (1935) reported brix and brix-ratio as useful criteria of maturity. Later on, it was recognized that both temperature and soil moisture played dominant role in cane maturity. Lower temperature results in reduced nutrient uptake which in turn results in slower growth. As growth subsides, most of the sugars produced are stored as sucrose. Decreased soil moisture leading to reduced moisture content of the stalk and consequent dehydration, forces the conversion of reducing sugars to sucrose (Clements *et. al.*, 1948 ; Humbert, 1968). Subsequently, considerable amount of research attention was focussed to identifying good indicators of plant moisture stress leading to maturity. Although considerable amount of work was done by different investigators on indices such as 4/5 joint moisture (Tanimoto, 1962), number of green leaves (Humbert, 1968), moisture of 8-10 internodes (Humbert *et. al.*, 1965), spindle moisture (Singh, 1966), and brix (Moller, 1973), the major emphasis has lately been given to the relationship of sheath moisture with pol.

In Bangladesh, no work has so far been undertaken on sheath moisture of sugarcane in relation to maturity. In this preliminary investigation, an effort was made to find the relationship between the sheath moisture status of some selected clones with their pol at different months of the maturity phase.

MATERIALS AND METHODS

The experiment was conducted at the Sugarcane Research and Training Institute, Ishurdi, during the 1983 crop season with ISD-16, ISD-2/54, I-60/74 and L. Jaba-C. The experiment was laid out in a randomized complete block design with split plot arrangement of treatments replicated thrice. The size of each main plot was 49m x 3m under each clone. Each plot was split into seven sub-plots each being represented by three 7-meter long rows to enable destructive sampling of cane for sheath moisture and pol determinations at different months begining from August. The distance between rows and clones was one meter. The crop was raised under normal cultural cares including weeding and fertilization with NPK fertilizers @ 275 kg, 275 kg and 182 kg of Urea, triple super phosphate (TSP) and muriate of potash (MP) respectively per hectare. Full quantity of TSP and one-third quantities each of urea and MP were applied as basal dressing. The remaining two-thirds of urea and MP were applied in two equal splits before June. The experimental plots were irrigated once to ensure adequate germination.

For detemining sheath moisture, leaf sheath numbers 3-6 were collected and oven dried according to the procedure of Lonsdale and Gosnell (1974). The pol (%) cane was determined by the Lead Sub-Acetate method (Meade, 1963) on the same stalks used for sheath moisture determinations. The determinations were continued for seven consecutive months starting from August. In order to determine possible clonal differences data were subjected to F - test, and LSD (Least Significant Difference) values were worked out where a significant difference was obtained by the F - test (Steel and Torrie, 1980). Sheath moisture and pol data were analysed for determining correlation coefficient (r).

RESULTS AND DISCUSSION

The results of the experiment are reported in table 1 and figures 1 and 2. Results indicate no significant difference among the clones in respect of sheath moisture and pol in the months of August and September at which time the mean sheath moisture and corresponding pol were around 79 % and 10 % respectively. In October, however, the sheath moisture dropped considerably nearing 76 %, and pol exceeded 14%. Significant clonal differences in pol (%) were obtained at this time. The maximum pol (%) was recorded with the clone I-60/74 followed by Isd-16. Similar response was obtained for December at which time sheath moisture further dropped down to about 73 % with concommitant increases in pol to about 19 %. There was no significant change in pol (%) cane in January as compared to that of December in spite of a drastic reduction of sheath moisture (%) as low as 54.79 % in Isd-16. The January and February data revealed significant clonal differences in sheath moisture during this period with no appreciable change or differences in pol (%) cane. Among the clones tested, the highest pol (%) was recorded with I-60/74 followed by Isd-16 (Table 1).

Table 1. Mean sheath moisture (SM) % and corresponding pol % of the clone at different months of the maturity phase.

Month / Clone	August		September		October		November		December		January		February		Mean	
	SM	Pol	SM	Pol	SM	Pol	SM	Pol	SM	Pol	SM	Pol	SM	Pol	SM	Pol
Isd-16	79.33	8.75	78.90	12.92	75.70	15.99	74.15	16.27	72.28	18.56	54.79	19.44	52.01	19.66	69.59	15.94
Isd-2/54	78.33	8.14	79.17	10.17	76.13	12.21	74.95	15.70	73.10	17.41	65.94	18.39	70.00	19.78	73.94	14.61
I-60/74	79.16	10.93	76.84	13.58	75.78	16.98	74.19	18.76	72.58	28.11	64.94	20.49	70.93	20.53	73.53	17.43
L.Jaba-C	79.75	11.06	78.29	10.55	76.43	13.44	74.16	16.29	72.74	18.14	66.90	19.49	66.60	19.37	73.55	15.47
LSD(0.05)	—	—	—	—	—	0.92	—	—	—	0.60	2.68	0.97	5.58	—	—	—

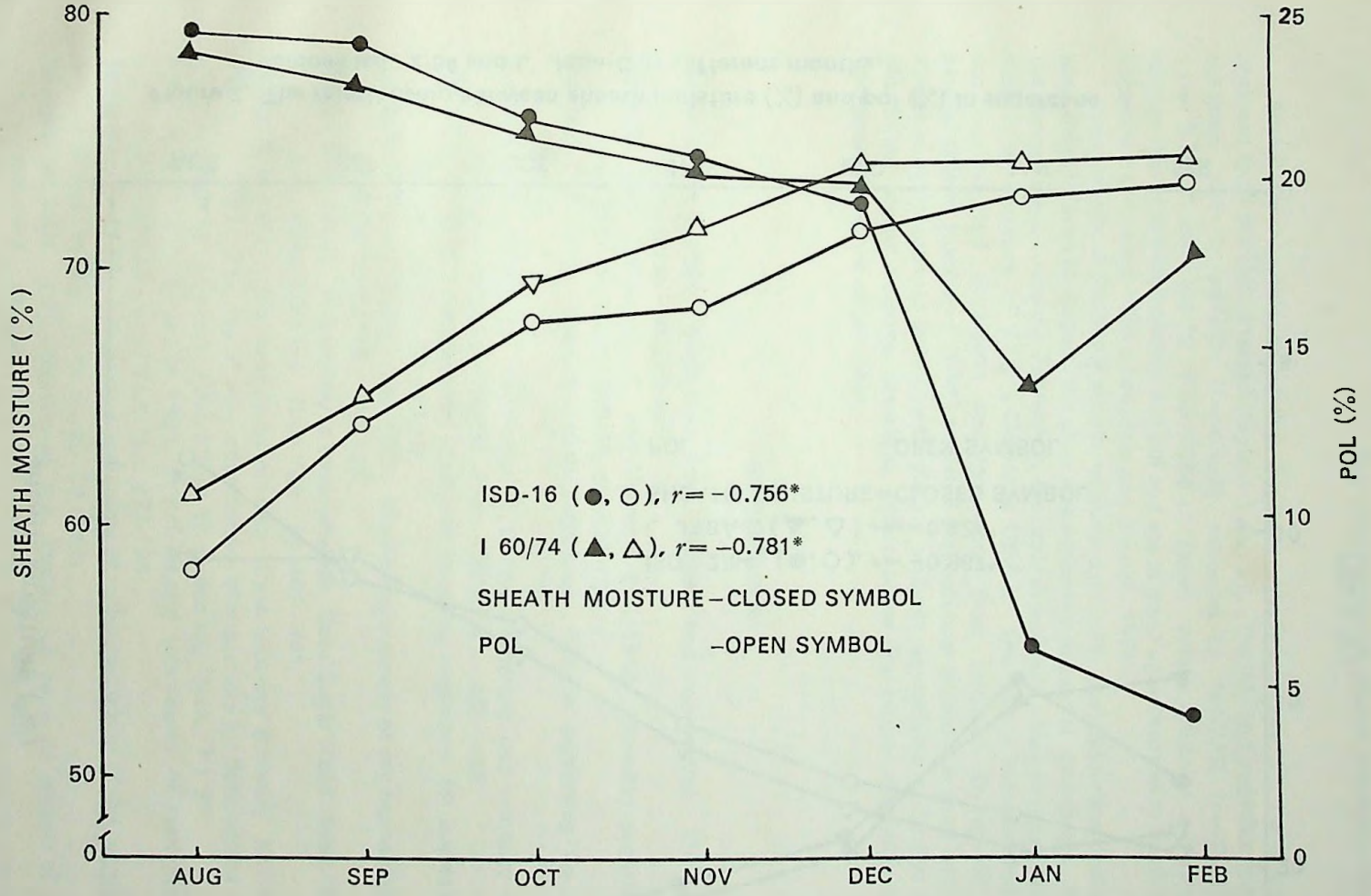

Figure 1. The relationship between sheath moisture (%) and pol (%) in sugarcane clones Isd. 16 and I-60/74 at different months.

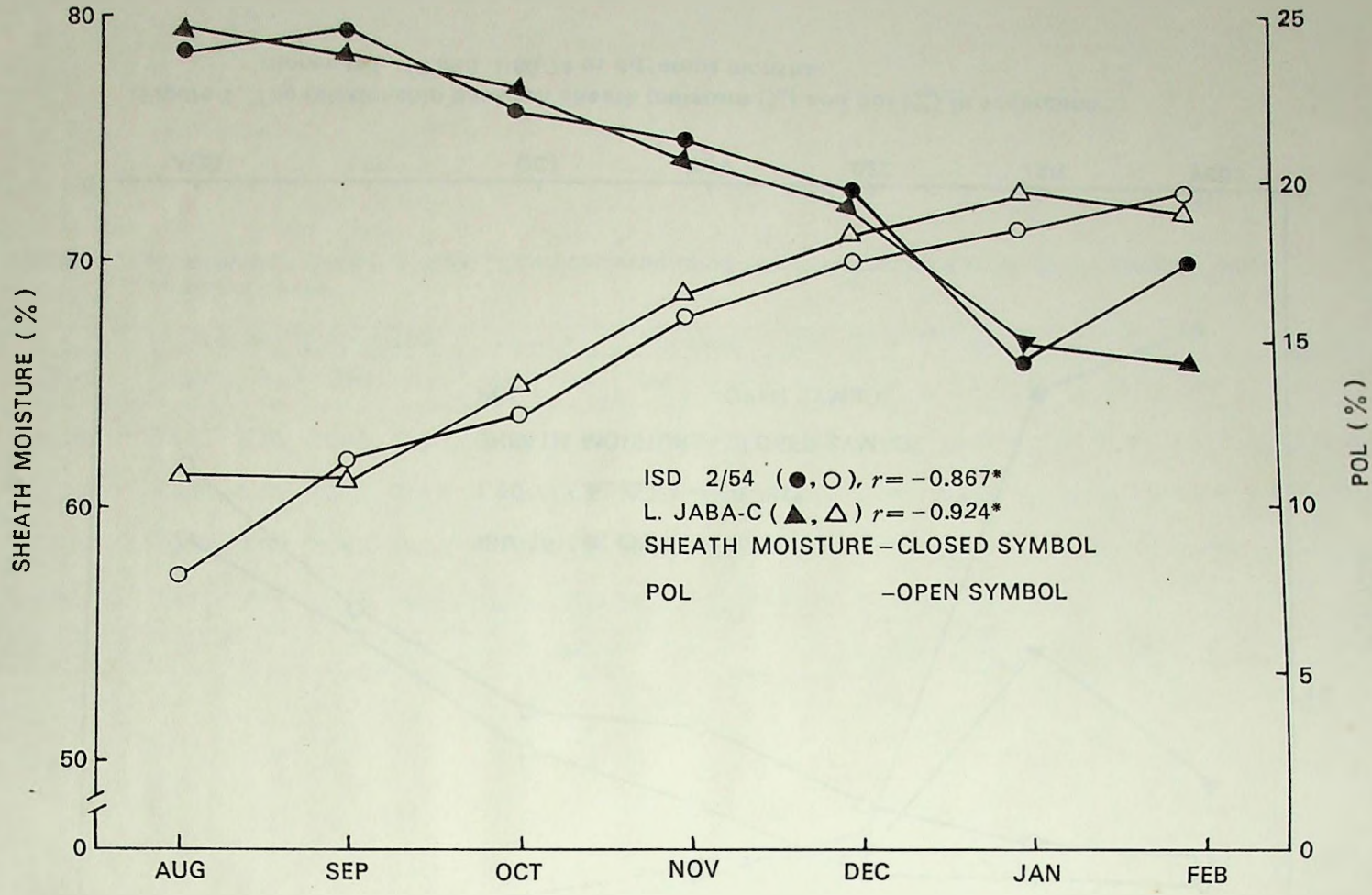

Figure 2. The relationship between sheath moisture (%) and pol (%) in sugarcane clones lsd. 2/54 and L. Jaba-C at different months.

Significant negative correlation between sheath moisture (%) and pol (%) was obtained in all the clones tested (Figures 1 and 2). The highest negative correlation was obtained with L. Jaba-C (r=-0.924) followed by Isd-2/54 (r=-0.867), I-60/74 (r=- 0.781) and Isd-16 (r=-0.756). These values indicate a strong negative relationship of sheath moisture and pol and are in good agreement with the findings in the literature (Clements, 1980 ; Lonsdale and Gosnell, 1974).

Comparisons of the initial sheath moisture data with the theoretical values of 84% indicate that even in August, the crop was subjected to partial drying-off. Similarly at the harvest stage (January, February), the sheath moisture value dropped far below the theoretical optimum of 74% (Clements, 1980). The results indicate that majority of our non-irrigated sugarcane undergo more - than - optimum drying - off during the harvest season. Humbert (1968) reported that optimum moisture in cane with 71 to 73% sheath moisture ensures better juice quality without appreciable reduction in tonnage. Monitoring sheath moisture, therefore, offers scope for proper rippening of cane and consequently higher sugar yield.

REFERENCES

Clements, H. F. 1980. Sugarcane crop - logging and crop control. The University of Hawaii press, pp. 250-265.

Clements, H. F. ; Shigeoura, G. and Akamine, E.K. 1948. Ripening sugarcane. Hawaii Agr. Expt. St. Rept. 1946-48, pp. 120-124.

Humbert, R. P. 1968. The Growing of sugarcane. Elsevier publishing Co., Amsterdam p. 779.

Humbert, R.P.; Zamora, M. and Fraser, T. B. 1965. Ripening and maturity control progress at Ingenio Los Mochis. *Proc. ISSCT*, **12** : 446—452.

Lennox, C.G. 1935. Fundamental studies in sampling sugarcane for sucrose. Hawaiian Planters' Record, **39** : 13-18.

Lonsdale, J.E. and Gosnell, J.M. 1974. Monitoring maturity of sugarcane during drying-off. *Proc. ISSCT*, 15 : 713-725.

Meade, G.P. 1963. Polarimetry in sugar analysis. Cane Sugar Hand Book. 9th Edition. John Wiley Sons Inc. New York. pp. 401—441.

Moller, R. B. 1973. The hand refractometer. Cane Growers' Bulletin, **37** : 4—7.

Singh, Y. 1966. The use of vegetative tissues of sugarcane for determining the moisture status of the plant. *Proc.* British W. Indies sug. Tech., **7** : 91.

Steel, R. G. D. and Torrie J.H. 1980. Principles and procedures of statistics. McGrow Hill Book Co., New York. pp. 172-194.

Tanimoto, T. 1962. 4-5 joint as indicators of moisture tension of the sugarcane plant. Hawaiian Sug. Tech. Rept., **20** : 265.

Wolters, W. 1931. Determination of the ripeness of cane by means of pre-harvest sampling. Hawaiian Planters' Record, **35** : 411-418.