IMPROVING SPROUTING OF STUBBLE CROP IN LOW TEMPERATURE AREAS

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ABSTRACT

Studies on improving the sprouting of a sugarcane stubble crop following a plant crop harvested during a low temperature period (November-December) were carried out at the PAU Sugarcane Research Station, Jullundur Punjab (India). The results showed that spreading transparent polythene (250 gauge) over harvested stubble resulted in a significant increase in shoot and stalk population and cane yield. Loosening of soil also had a beneficial effect on the sprouting. Among plant growth regulators sprayed over shaved stubbles, Ethrel at 500 ppm, IBA at 100 ppm and TIBA at 50 ppm increased the plant population and yield of a stubble crop.

INTRODUCTION

In the north Indian sub-tropical cane growing belt, sprouting of ratoons, from November-December harvested plant crops, is very poor. This results in a gappy stand, a lower plant population and a low yield in the ratoon crop. This is one of the major hindrances to increasing the area under early maturing high sugar varieties, which are harvested during this period. The maximum and the mean minimum temperatures during November-December in Punjab are 24°C and 4.0°C respectively. The buds on the underground stubble remain dormant during this low temperature period and start sprouting only with the onset of the spring season in February-March. By this time the capacity of the buds to germinate is greatly reduced. With a view to improvement of the sprouting of such a stubble crop, investigations were carried out at the PAU Sugarcane Research Station, Jullundur, by means of cultural practices and the use of plant growth regulators. The results of these studies are reported in this paper.

MATERIALS AND METHOD

Two small-scale experiments were conducted with the following treatments:

Experiment 1

T_1 Transparent polythene cover over underground stubble.
T_2 Black polythene cover over underground stubble.
T_3 Farmyard manure cover over harvested stubble.
T_4 Loosening of soil around stubble.

The experiment was laid out in a randomised black design with three replications and plot size of 18 sq. meter.

FIGURE 1. Transparent polythene cover over harvested stubbles.

Experiment 2

The following 13 treatments were tried:

T_1	Indole-3-acetic acid (IAA)	50 ppm
T_2	Indole-3-acetic acid (IAA)	100 ppm
T_3	Indole-butyric acid (IBA)	50 ppm
T_4	Indole-butyric acid (IBA)	100 ppm
T_5	Gibberellic acid (GA)	50 ppm
T_6	Gibberellic acid (GA)	100 ppm
T_7	Tri-iodo benzoic acid (TIBA)	25 ppm
T_8	Tri-iodo benzoic acid (TIBA)	50 ppm
T_9	2-chloroethyl phosphonic acid (Ethrel)	200 ppm
T_{10}	2-chloroethyl phosphonic acid (Ethrel)	500 ppm
T_{11}	2-chloroethyl trimethyl ammonium chloride (Cycocel)	200 ppm
T_{12}	2-chloroethyl trimethyl ammonium chloride (Cycocel)	500 ppm
T_{13}	Control	

There were two replications and the plot size was 12 sq. meter. The chemicals were sprayed over the shaved stubbles after harvesting.

The studies were conducted with Co J 64, an early maturing high sugar variety. The plant crop was harvested in the first week of December, stubble shaved immediately afterwards and various treatments given. Growth regulators were sprayed with Tween-20 as wetting agent. The stubble was covered

TABLE I.

Treatments	Shoot population '000'/ha 29.7.76	No. of millable stalks '000'/ha	Linear growth in cm.	Millable stalk length in cm.	Stalk girth in cm.	Cane yield in m. tons/ha.
Transparent polythene	232.20	130.0	179.40	151.70	2.18	63.10
Black polythene	133.30	68.9	158.80	143.20	2.21	30.30
Loosening of soil	172.20	88.9	170.70	153.60	2.20	43.60
Farmyard manure	124.50	80.0	161.10	151.00	2.26	39.70
C.D. at 5%	N.S.	32.60	N.S.	N.S.	N.S.	21.03

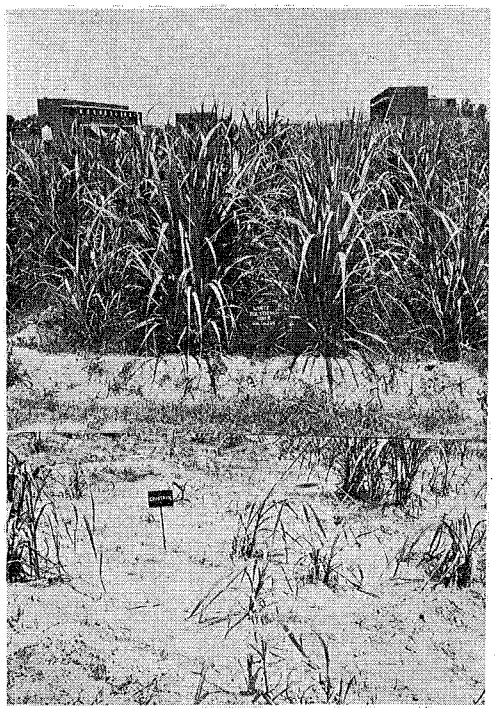
with soil after spraying. Polythene sheet was removed from the plots, with the approach of the spring season, in the first week of February. The tillering data were recorded, at the time of maximum tiller population in the first week of July. The growth data were recorded at the end of September. Millable stalk population, millable stalk length, stalk girth, yield and juice analysis data were recorded at the time of harvest, in the third week of November 1976. The data for experiment I were statistically analysed.

RESULTS AND DISCUSSION

Experiment 1

The data are presented in Table I.

FIGURE 2. Good shoot population due to polythene cover and poor sprouting (control).



The shoot population, millable stalk number and cane yield were significantly higher where the stubbles had been covered with transparent polythene. Loosening of soil was the next best treatment. A significant increase in cane yield under transparent polythene cover was due to better sprouting, which resulted in higher shoot and stalk populations and better growth. Higher temperature and humidity were the contributing factors for better sprouting under transparent polythene cover. These results show that low temperature is one of the major factors in inhibiting sprouting of the

TABLE II

Treatments	Shoot population '000'/ha 29.7.76	No. of millable stalks '000'/ha	Linear growth in cm.	Millable stalk length in cm.	Stalk girth in cm.	Cane yield in m. tons/ha.
IAA 50 ppm	92.50	55.80	126.20	111.20	2.08	18.50
IAA 100 ppm	85.80	64.20	147.90	127.30	1.99	33.25
IBA 50 ppm	162.50	97.50	158.30	134.70	2.09	39.58
IBA 100 ppm	195.00	98.30	172.40	143.50	2.14	46.50
GA 50 ppm	150.80	72.50	149.90	133.90	2.05	33.75
GA 100 ppm	175.00	87.50	158.40	139.30	2.19	42.92
TIBA 25 ppm	107.50	65.80	142.00	119.20	2.18	34.17
TIBA 50 ppm	160.00	100.00	153.90	149.20	2.15	43.75
Ethrel 200 ppm	160.80	88.30	142.00	128.50	2.19	35.25
Ethrel 500 ppm	195.00	106.70	168.40	149.90	2.10	49.58
Cycocel 200 ppm	106.70	65.80	146.40	128.30	2.16	28.75
Cycocel 500 ppm	95.00	67.50	143.30	121.50	2.25	28.58
Control	50.00	25.80	105.20	100.70	2.10	8.33

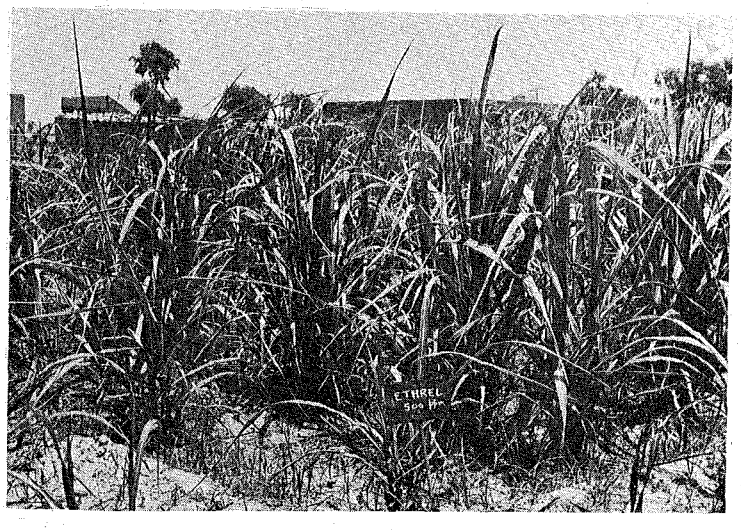
buds on underground stubble. Panje *et al*[3] (1964) also reported the beneficial effect of polythene cover on germination of sugarcane in low temperature areas. The beneficial effect of loosening the soil on sprouting seems to be due to breaking of soil compaction. Black polythene cover did not show any beneficial effect on sprouting of stubble, probably because sunlight did not penetrate. The shoots under the black polythene cover were weak and lacked chlorophyll. Farmyard manure, which was spread over the stubble in an attempt at increasing the absorption of sunlight during the day, did not produce any beneficial effect. Further investigations on this aspect are in progress.

Experiment 2

The results are given in Table II.

All the chemicals increased the number of sprouts and this resulted in higher shoot populations, stalk number and cane yield by comparison with the control. Ethrel at 500 ppm (Figure 3), IBA at 100 ppm and TIBA at 50 ppm gave better results than the other chemicals. The cane yield in the control was only 8,33 tons/ha by comparison with 49,58, 46,50 and 43,75 tons/ha after treatment with Ethrel, IBA and TIBA, respectively. These results indicate the beneficial effect which these chemicals have on the sprouting of an early harvested crop. Ethrel seems to have improved sprouting by inactivating apical dominance. A concentration of 500 ppm was more effective than one of 200 ppm.

FIGURE 3. Good sprouting with Ethrel (right). Poor sprouting control (left).



Treatment with Ethrel causes the release of ethylene in plant tissues (Warner and Leopold[7], 1969) which stimulates peroxidase activity leading to the destruction of endogenous auxins responsible for the inhibition of buds. Higher concentrations of exogenous auxin induce the synthesis of ethylene in the treated tissues (Burg and Burg, 1968) which results in the loss of apical dominance. In this respect IBA seems to be more effective than IAA. TIBA, being anti-auxin, destroys endogenous auxin directly and relieves the buds from inhibition. TIBA was therefore effective in improving sprouting.

These investigations are being continued, in an attempt at confirming the beneficial effect of these chemicals on an early harvested crop.

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ESTUDIOS EN EL MEJORAMIENTO DEL BROTE DE UNA COSECHA DE RETOÑOS EN ZONAS DE BAJA TEMPERATURA

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RESUMEN

Estudios en el mejoramiento del brote de retoño de una caña plantilla cosechada durante períodos de bajas temperaturas, durante (noviembre-diciembre) fueron llevadas a cabo en ""PAU Sugarcane Research Station", Jullundur Punjab (India). Los resultados demostraron que tendiendo una cubierta transparente de polietileno de "250 gauge" sobre el retoño resultó en un aumento significativo de brotes, población de tallos y rendimiento de caña sobre el control. El remover el suelo también resultó en beneficio en el brote. Aparte de los reguladores de crecimiento aplicado sobre las cepas, el Ethrel a 500 p/m, IBA 100 p/m y TIBA 50 p/m aumentaron la población de plantas y el rendimiento de las cepas.