EFFECTS OF FUSILADE SUPER AND ETHEPHON AS SINGLE AND TANDEM TREATMENTS ON FOUR SUGARCANE VARIETIES

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Abstract

The responses of four varieties to the single sprayings of ethephon and Fusilade Super and to these chemicals applied in tandem were compared in the plant and three ratoon crops. The tandem treatment was best on N19 and N22 while Fusilade Super was the most effective ripener for N12 and CP66/1043. The conditions under which the tandem treatment would be the most effective could not be elucidated. Ethephon was only effective in one crop of N19 and N12. Current cost to benefit ratios of 4.1 and 4.9 were estimated but could exceed 10 when matching varieties with the most appropriate treatment and ideal conditions for chemical ripening.

Introduction

The South African sugar industry has researched ways of improving sugar yields by manipulating growth of sugarcane crops with chemicals since mid 1960. The focus has been on chemicals that increase sucrose yields by raising cane quality. The chemicals registered as ripeners of sugarcane in South Africa are ethephon (2-chloroethyl phosphonic acid), glyphosate (isopropyl ammonium salt of N-phosphonomethyl glycine), Fusilade Super (fluazifop-P-butyl) and Gallant Super (haloxyfop-P-butyl). It was estimated that an additional 31 000 tonnes of sucrose (valued at R28 million) were produced by applying ripeners to 38 600 hectares in 1997 (Donaldson, 1994).

Good rainfalls during the summer of 1999–2000 affected growth of crops such that cane quality was very poor at the opening of the milling season of 2000–2001. Approximately 52 000 hectares of sugarcane were sprayed with ripeners by commercial aircraft during 2000. The implementation of a payment system that takes cognisance of cane quality would also have had an influence on the greater area sprayed during 2000.

Much of the early research on chemical ripening in South Africa was done on the variety NC0376. This variety has responded particularly well to all currently used ripeners. There is concern that many of the higher sucrose containing varieties that were released after 1980 will not respond as favourably to chemical ripening as does NC0376. For unknown reasons responses of the variety N14 to ethephon have been poor (Leibbrandt, 1989). The application of ethephon followed by Fusilade Super (here referred to as the tandem treatment) has been very effective on NC0376. An experiment was therefore initiated to compare the responses of four varieties to ethephon and Fusilade Super applied as single treatments and in tandem. This paper includes the results of two further crops of the experiment reported by Donaldson (1994).

Methods and materials

The experiment was sited at Pongola (27°23’S, 31°37’E, 307 m asl) on a deep Hutton sandy clay (Ultisol–USDA taxonomy) soil. Plots of the varieties N12, N19, N22 and CP66/1043 were planted, irrigated and supplied with adequate amounts of fertiliser. Weeds were controlled with pre-emergent herbicides and hoeing when necessary. Ethephon was applied at 720 g ai/ha 11 weeks before harvesting and Fusilade Super at 37.5 g ai/ha 8 weeks before harvesting. Treatments were applied by a tractor-mounted boom in the plant crop and by a hand-held boom in the ratoon crops. Samples of 16 stalks per plot were taken at the time of spraying ethephon and on two or three later occasions for standard quality analysis. Two rows were harvested and weighed at about 12 months to determine cane and sucrose yields. Sucrose content was converted to estimated recoverable sucrose using the formula: Ers = sucrose % cane—(0.485 non-sucrose % cane)—(0.019 fibre % cane). In this paper estimated recoverable sucrose yields are referred to as sucrose yields for the sake of brevity.

Results and discussion

Responses to ethephon at harvesting were generally poor and reached levels of statistical significance (P<0.05) in only the second ratoon crops of N19 and N12 when compared to the non-treated control (Figure 1). Ethephon reduced cane yields of N22 on average by 10% in three crops.

Good responses in sucrose content were recorded at earlier sampling dates of the plant and 3rd ratoon crops of N22 treated with ethephon (data not presented).

Fusilade Super also reduced cane yields of both N22 and CP66/1043 in the plant and 1st ratoon crops on average by 11% which affected sucrose yields. This is further evidence that a shorter spray to harvest interval would be more appropriate for N22 and CP66/1043. Poor responses to ripeners are expected in the 3rd ratoon when soil moisture is low as was the

KEYWORDS: Cost to Benefit Ratio, Growth Regulators, Ripeners, Sucrose Yields.
case in this study (Donaldson, 1995). However, significant responses in terms of sucrose yields to the tandem treatment were recorded, except from CP66/1043 (Figure 1).

The tandem treatment was more effective than both single treatments in all crops of N19 (Figure 1). Sucrose yields accumulated over four crops were 6.4 t/ha more than from either ripener applied alone. The highest sucrose yields of the plant and 3rd ratoon crops of N22 and N12 were from the tandem treatment. Over the four crops, the tandem treatment yielded 1.8 and 0.8 t/ha sucrose more than the single ripeners applied to N22 and N12, respectively. There was no gain from the tandem treatment above the single applications of Fusilade Super to CP66/1043.

Responses greater than 0.15 t/ha sucrose are needed to benefit from single applications at the current price of sugar and costs of spraying chemicals. An additional response of 0.15 t/ha sucrose above that of the best single treatment would warrant the use of the tandem treatment. Responses averaged for N19 and N22 to Fusilade Super in this experiment was 0.76 t/ha. In comparison, the average response of these two varieties to the tandem treatment was 1.78 t/ha sucrose. Cost to benefit ratios of 4.1 and 4.9 were realised from applying Fusilade Super and from the tandem treatment, respectively. When matching the correct variety, condition of the crop and most appropriate ripener treatment, cost to benefit ratios greater than 10 can be expected. This was evident from the average 2.45 t/ha sucrose gained from spraying N12 with Fusilade Super in this experiment.

Conclusions

There are clearly large economic benefits to be gained from chemical ripening. The results from this experiment suggest that not all varieties will benefit from the tandem treatment. However, when applied to N19 the tandem treatment enhanced the consistency of achieving substantial economic returns. The possibility that the tandem treatment is effective when moisture stress reduces the efficacy of the single treatments needs to be investigated. There is also a need to verify whether a shorter spray to harvest interval is more appropriate for varieties like N22 and CP66/1043.
REFERENCES


LES EFFETS DU FUSILADE SUPER ET DE L’ETHREL APPLIQUES SEULS ET EN TANDEM SUR QUATRE VARIETES DE CANNE

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Résumé

L’efficacité de Fusilade super, de l’ethrel et les deux produits appliqués en tandem a été évaluée sur quatre variétés de la canne vierge suivie de trois repousses. L’ethrel ne fut efficace qu’en une saison sur les variétés N19 et N12. Le Fusilade Super fut plus efficace pour les variétés N12 et CP66/1043, tandis que le traitement en tandem le fut pour les variétés N19 et N22. Les conditions optimales pour l’apport du traitement en tandem n’ont pu être établies. Cependant il est à noter que cette application sélective des mûrisseurs pour s’assurer les conditions optimaux pourrait s’avérer très coûteuses avec un rapport coût et bénéfice dépassant 10 comparé à un rapport actuel de 4,1 et 4,9.

Mots clés: Rapport coût et bénéfice, régulateurs de croissance, mûrisseurs, rendement en sucre.

EFECTOS DEL FUSILADE SUPER Y ETEPHON APLICADO SOLO Y EN MEZCLA A CUATRO VARIEDADES DE CAÑA

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Resumen

Se comparó la respuesta de la plantilla y tres socas de cuatro variedades de caña a las aplicaciones sencillas o con aplicaciones de Etephon seguidas por Fusilade Super. La aplicación sucesiva de dos compuestos fue mejor en N19 Y N22 mientras que el Fusilade Super fue más efectivo como madurador de N12 y CP 66/1043. No se pudieron establecer las condiciones bajo las cuales el tratamiento de aplicación sucesiva es más efectivo. Etephon solamente fue efectivo en un cultivo de N19 y N12. Se obtuvieron relaciones costo/beneficio entre 4,1 y 4,9 pero esta relación puede exceder el valor de 10 cuando se aplican los tratamientos adecuados a cada variedad y además existen condiciones ideales para la maduración química.