THE EFFECTS OF CANE ROW SPACING AND 50% POPULATION REDUCTION UPON SMUT EXPRESSION IN AN INFECTED CROP

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Abstract

A 50% reduction of populations in plots of NCo 376 at 3 months of age was shown not only to stimulate the production of more tillers, but also to increase smut incidence, as the seedcane was infected. It was concluded that roguing heavily smut infected cane fields will increase, not decrease, smut incidence. The importance of not allowing infection to develop beyond low incidence levels was emphasized.

Introduction

Intensive roguing of three successive NCo 376 crops was shown to have no significant effect on millable cane populations at the time of harvest (James[3]). Earlier work (Gosnell[2]) indicated that there is an optimum stalk population for each stage of crop development and (James[4]) concluded that, if seedcane was heavily infected with smut, subsequent roguing of infected stalks would stimulate the production of infected tillers as the population equilibrium was re-established. To test this contention the following experiment was initiated.

Experimental

Three-budded setts of NCo 376 were first immersed in a smut spore suspension (more than 10^6 spores per ml of water) prior to planting in plots having rows spaced (i) 0,75m (ii) 1,50m or (iii) 3,00m apart. The row length in all instances was 3,10m. Treatments (i) and (ii) were duplicated, every alternate 50 cm of cane row being removed from the (a) plots 3 months after planting, whilst the (b) plots were left unchanged.

The total number of tillers per treatment were recorded after 3 months (prior to population reductions), after 6 months, and at the time of harvest (9 months). Smut whips were recorded weekly and strict precautions were taken to avoid cross-infection when the whips were rogued.

Results

Tiller counts

Three months after planting, the cane in the plots having rows 0,75m apart had significantly more tillers than the cane in the plots with rows 1,50m apart. 407600 per ha. vs 220 900 per ha.) Similarly, the populations in the plots having rows 1,50m apart were significantly greater than those in the plots with rows 3,00m apart. (Table I).

After 6 months the populations in the plots where 50% of the stalks had been removed were still significantly less than those in the comparable plots where no stalks had been removed (Table I).

Tiller counts when the crop was 6 months old were approximately the same in plots of the following treatments: (ia) and (iib); (iia) and (iii). When the crop was harvested after 9 months, the effects of reductions in stalk numbers were still significant in the 0,75m and 1,50m row spacing treatments. Whilst the stalk populations were only slightly higher in treatment (ia) compared with (iib), the (iia) treatment plots had significantly more tillers per ha than did treatment (iii) plots (Table I).

Smut whips

The smut whip population data were highly variable. Analyses were therefore carried out on the logarithm of the variate because the data had a log-normal distribution (Brownlee[1]). Data thus presented in Table II are the geometric means (Snedecor[5]).

A 50% reduction of populations in the 0,75m and 1,50m row spacing treatments had no significant effects on smut whip populations after 6 months, or at the time of harvest. Treatment (ia) appeared to produce more whips than did treatment (iib); and, similarly treatment (iia) had a higher whip population than did treatment (iii). However, these differences were not statistically significant.

TABLE I

Tillers per hectar in 1000's

Time from Planting	Treatment					C of V%	L.S.D.		
	(i) 0,75m row spacing		(ii) 1,50m row spacing		(iii) 3,00m row spacing		5%	1%	0,1%
	(a) 50% reduction	(b) No reduction	(a) 50% reduction	(b) No reduction					
3 months*	403,5	411,6	223,4	218,4	109,3	9,5	39,9	56,0	97,1
6 months	196,4	455,4	118,2	235,0	118,6	10,0	34,6	48,6	68,6
9 months	182,2	250,8	128,7	171,2	87,2	14,0	35,3	49,5	69,6

*Prior to population reduction.

TABLE II

Smut whips per hectare in 1000's

Time from planting	Treatments					C of V%
	(i) 0,75m row spacing		(ii) 1,50m row spacing		(iii) 3,00m row spacing	
	(a) 50% reduction	(b) No reduction	(a) 50% reduction	(b) No reduction		
6 months	3,3	6,2	2,0	2,4	1,2	9,0
9 months	28,9	33,3	14,9	20,7	10,7	4,3

Discussion

It might have been expected that plots receiving treatments (ia) and (iib), and treatments (iia) and (iii) would have approximately the same number of stalks per hectare 6 months and 9 months after planting. However, Table I shows that 9 months after planting, plots receiving treatment (iia) had significantly more tillers per hectare than plots receiving treatment (iii) and populations in plots receiving treatment (ia) were greater than those in plots receiving treatment (iib), although not significantly so. Thus removal of *circa* 50% of the population (by digging out every alternate 50cm of cane row, which is equivalent to severe smut roguing) stimulates the remaining stools to produce more tillers.

Since the initial seedcane was smut-infected, some of the new tillers also developed into smut whips. Table II shows that, while population reductions 3 months after planting depressed smut whip populations counted 6 and 9 months after planting in both the 0,75m and 1,50m row spacing treatments, and these differences were not significant. In fact, at the time of harvest, whip populations in the plots of the two 0,75m row spacing treatments were nearly the same, and in the plots where the rows were 1,50m apart, there were approximately 15 000 whips per hectare in the (a) plots compared with 20 000 in the (b) plots (Table II).

It can be concluded that roguing canefields that are heavily infected with smut will achieve the opposite effect to that intended, i.e. smut incidence will be increased per unit length of remaining line, and only slightly reduced per unit area of land. This confirms the conclusion reached by (James[4],) who found in a smut roguing experiment that stool roguing increased smut incidence in the plant crop of heavily infected NCo 376. There is therefore a threshold level in smut incidence above which roguing can lead to crop reduction.

Since it has been demonstrated that smut disease depresses NCo 376 sucrose yields per hectare significantly (James[3]), this experiment emphasizes the necessity for keeping infections at the lowest possible levels.

REFERENCES

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