FOUR YEARS OF NUMICIA SURVEY

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Since the recognition of *Numicia viridis,* Muir, as a pest of sugarcane (Dick 1963), annual surveys have been carried out with two main objectives. In the first place it has been considered important to study the geographical distribution of the insect within the area covered by the South African sugar industry, to notice any population trends which may occur and to have early warning of increases in particular areas. For example, the 1966 survey revealed the presence of a local infestation near Paddock on the Natal South Coast and, although it has not proved necessary to apply specific control measures, this area has been kept under observation since the survey. Secondly, it was hoped that inspection of several hundred sites under various ecological conditions might yield information on the type of environment in which outbreaks are most likely to occur. Four surveys have been carried out and this paper is an attempt at collating and generalizing upon the information collected. Population studies in Swaziland are not included since these are carried out in a different way and form the subject of a special research project (Carnegie 1967).

Methods

In every selected site five counts are made, each representing the population found in one square yard of cane-field. The area is defined by placing a sheet of black plastic material between the cane rows, where it is kept in position by two strips of wood attached to opposite sides. Nymphs and adults of *Numicia* falling on to the plastic sheet are counted and recorded separately. During the 1963 survey, the sugarcane above and around the sheet was liberally dusted with a 5 per cent malathion powder and the sheet was left in position for five hours, after which the insects which had fallen on it were counted. This method enables fairly accurate counts to be made even when insects are present in large numbers, but it limits the sites which a team of two observers can examine per day to about five. Each site must be visited twice, first to apply the insecticide and later to collect and count the insects. In addition, the sites which can be examined in a day are limited by the number of plastic sheets which can be carried. Since populations found in 1963 were seldom high enough to make counting difficult, it was decided that subsequent surveys would be based on the insects landing on the plastic sheet when the surrounding cane is vigorously shaken. This technique may not be quite as accurate as the malathion method but it enables a team provided with a single sheet to examine up to thirty sites in one day.

Counts are entered on a standard form on which particulars of locality, irrigation, variety, crop, whether plant or ratoon, and age of cane are recorded. Forms are completed even when no *Numicia* is found.

Assessment of Results

During outbreaks in such areas as Pongola and Swaziland, *Numicia* occurs in practically every field although numbers vary considerably from site to site and populations fluctuate seasonally, reaching peaks during which several hundred individuals per square yard can sometimes be found (Carnegie 1966). On the other hand, over the rest of the sugar belt counts exceeding five individuals per square yard are comparatively rare. Since the inclusion of a few very high counts might prejudice generalizations on the effect of environmental factors, it was decided to use the percentage of positive sites in preference to the number of individuals as a standard for comparison.

In 1963, only 93 sites were examined and information on some of the factors now being investigated was too meagre to be included in discussions. Subsequent surveys dealing with a far greater number of sites produced figures on which somewhat greater reliance can be placed.

Some of the information in this paper has appeared in Annual Reports of the Experiment Station of the S.A. Sugar Association (1963–1966). Slight discrepancies in some of the figures are due to the inclusion of records which became available after publication of the Reports or, in one case, to the omission of a few records which were thought to be inaccurate. They do not appreciably affect the results.

In the seven tables appended to this paper, information on the association between certain environmental factors and the incidence of *Numicia* is extracted from the results of surveys. Although some fairly definite trends are indicated, it cannot always be assumed that association necessarily implies causality since some of the factors considered are linked together. Thus Pongola cane is all grown on flat land under irrigation, while most cane in the Midlands area is grown on hills without irrigation. Similarly, the choice of sugarcane variety is largely influenced by environment. Nevertheless, for most of the factors considered here, enough sites have been examined in the various environments for the results to have some value.

Discussion of Results

Since surveys have been undertaken for only four years, the results cannot be expected to yield much evidence on long-term fluctuations. The figures for 1963 were based on a relatively small number of

sites which were, however, well scattered over the sugarcane area. If they can be accepted, it would appear that *Numicia* incidence has increased since then (Table I). Some of the apparent trends in

TABLE I

Numicia Populations from 1963 to 1966

	Over 5 per sq. yard		Up to 5 per sq. yard		None found	
	Sites	%	Sites	%	Sites	%
1963	3	3.23	23	24.73	67	72.04
1964	86	10.96	425	54.14	274	34.90
1965	36	5.51	294	44.95	324	49.54
1966	28	5.43	266	51.55	222	43.02

TABLE II

Numicia Incidence by Regions

Figures represent percentage of sites positive

	1963	1964	1965	1966
E. Transvaal	—	—	—	8.00
Pongola	33.33	97.06	100.00	97.06
Zululand	48.28	69.86	45.62	36.60
N. Coast	19.44	65.69	65.46	73.68
Midlands	0.00	2.63	4.44	38.24
S. Coast	21.43	65.06	71.30	64.20
Average	27.96	65.10	56.88	57.25

particular regions may possibly be explained (Table II). For example, the decrease in Zululand, particularly during 1966, was associated with the presence of a considerable amount of cane obviously affected by drought. The increase in the Midlands has almost certainly been due to the extension of sugarcane to areas more suitable for *Numicia*. On the South Coast, the infestation at Illovo practically disappeared after 1964 but the percentage of sites in which small numbers can be found has remained about the same for the last three years and there has been a slight build-up near Paddock. The Eastern Transvaal was, for the first time, included in the survey during 1966. A few positive sites were recorded but numbers were not high.

In the South African sugarcane area, alluvial flats constitute a special environment, often noticeably different from the rest of the country. For this reason, figures for *Numicia* incidence from these areas were extracted separately and compared with those from other environments (Table III). For three of the

TABLE III

Numicia Incidence and Topography

	1963	1964	1965	1966	Average
Alluvial flats	37.50	79.44	73.33	57.06	61.83
Other	22.95	61.77	43.00	56.76	46.12

four years under consideration, *Numicia* incidence has been noticeably higher on alluvial flats than elsewhere. In 1966, little difference was shown but this might to some extent be explained by the fact that much of the cane grown on flats in Zululand was suffering from drought when the survey took place.

The sites of severe outbreaks of *Numicia* have so far been areas in which cane is grown under irrigation. Figures for incidence on irrigated cane throughout the sugarcane area were therefore extracted separately and compared with those for unirrigated

TABLE IV

Numicia Incidence and Irrigation

	1963	1964	1965	1966	Average
Irrigated	36.11	81.18	68.90	67.72	65.26
Not irrigated	22.81	56.55	42.08	51.43	43.22

cane (Table IV). This indicated that, for the four years under discussion, incidence was appreciably higher in irrigated cane but no difference could be seen, from this point of view, between furrow and spray.

Figures for incidence in cane of different ages show little constant trend except that the insects are less often found on very young or very old cane than in cane of intermediate age. There is no appreciable difference in incidence between plant and ratoon cane.

Only five varieties of cane were inspected in a sufficiently large number of sites for comparisons

TABLE V

Incidence by Crop

	Plant cane	Ratoon
1964	70.00	61.55
1965	53.81	50.91
1966	50.00	59.54
Average	57.94	57.33

TABLE VI

Incidence by Age of Cane

	1964	1965	1966	Average
Up to 3 months	35.71	52.38	31.58	39.89
4 to 6 months	58.45	58.11	43.22	53.26
7 to 9 months	70.40	65.49	53.85	63.25
10 to 12 months	72.73	51.51	61.63	61.96
13 to 15 months	69.77	50.00	66.67	62.15
16 to 18 months	74.24	24.19	70.59	56.34
Over 18 months	46.15	7.14	68.42	40.57

TABLE VII

Incidence by Variety

	1964	1965	1966	Average
N.50/211	70.15	60.66	75.00	68.60
N:Co. 310	69.71	58.26	62.41	63.46
N:Co. 376	67.74	49.59	53.59	56.97
N:Co. 382	60.85	35.14	40.62	45.54
N:C. 293	24.49	29.03	48.48	34.00

to be made (Table VII). The results for these show a slightly, but consistently, higher incidence in N50/211 than in N:Co.310. Incidence in N:Co.376 is regularly slightly lower than in N:Co.310. The lower incidence in the other two varieties may be associated with the environments in which they are commonly grown. N:Co.293 occurs most frequently in high altitude areas and N:Co.382 in sandy fields, neither of which appears particularly to favour the presence of *Numicia.*

Summary

Methods for counting and recording numbers of nymphs and adults of *Numicia viridis,* Muir, during surveys from 1963 to 1966 are described.

The incidence of this insect in the major subdivisions of the South African sugar area is quoted for these four years. Incidence was found to be higher on alluvial flats than elsewhere, and higher in irrigated than in unirrigated fields. Fewer positive cases were found in very young or very old cane than in cane of intermediate age and there was no difference between plant cane and ratoons. Among sugarcane varieties, the percentage incidence was slightly, but consistently, higher in N50/211 than in N:Co.310. In N:Co.376 incidence was consistently somewhat lower than in N:Co.310.

Acknowledgements

The extensive surveys carried out from 1864 to 1966 were made possible by the collaboration of the Plant Disease Inspection Service, the Regional Representatives and the personnel of a number of sugar companies.

References

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4. *Rep. Exp. Stn. S. Af. Sug. Ass. 1962-63,* pp. 55-57.
5 *Ibid. 1963-64,* pp. 51-57.
6. *Ibid. 1964-65,* pp. 88-94.
7. *Ibid. 1965-66,* pp. 71-78.

Discussion

Dr. Thompson (in the chair): The bad outbreak of *Numicia* in 1962 in Swaziland does not appear to have recurred since.

Dr. Dick: There was a severe outbreak in a field at Big Bend eighteen months ago but *Numicia* may not have been the only cause of damage in this instance.

Mr. Landsberg: Can the presence of *Numicia* be related to climatic conditions?

Mr. Carnegie: We have rainfall and temperature figures for Ubombo Ranches but I do not think a particular climatic condition initiated the original outbreak.

Mr. Date: There was a difference in numbers of *Numicia* recovered per shake—was this reflected in the amount of visible damage to cane?

Dr. Dick: Other factors are involved, such as the stage of the insect and the age and growth of cane.

Mr. Carnegie: Varieties also play a part. Where we found the highest populations the cane was eight month old N:Co.376 and the symptoms were slight. That same population in N:Co.310 would produce very conspicuous symptoms of damage.

Mr. Date: I understand experiments have been made with predators from Mauritius?

Mr. Carnegie: Small trial shipments have been received from Mauritius and we have shown that the insects can feed on a diet of *Numicia* eggs alone and on a diet of *Perkinsiella* eggs, but we do not want to import any more until we can rear these hosts in large numbers.

Mr. Armstrong: Have the authors any information about the population trends of *Perkinsiella*?

Mr. Carnegie: There are large numbers of *Perkinsiella* on Eastern Transvaal cane, where *Numicia* is present at a lower level. Following dusting we have had increases of *Perkinsiella* numbers. We have identified an effective parasite for *Perkinsiella.*

Dr. Dick: *Tytthus* is used in other parts of the world as a predator where another species of *Perkinsiella* is a serious problem. *Tytthus* if introduced could be kept alive by *Perkinsiella* when *Numicia* was not present.

Mr. Harris: Surveys have shown that *Numicia* is most common in lush cane growing in alluvial areas. This may be associated with the fact that such cane is rich in proteins, the presence of which encourages the development of the reproductive system of insects.