SHORT NON-REFEREED PAPER

A NEW NEMATICIDE/THRIPICIDE FOR THE SOUTH AFRICAN SUGAR INDUSTRY

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Abstract

Nematodes cost the industry a significant amount of money each year due to cane yield loss. The most economical and effective method of managing this pest is chemical control. However, the most widely used product, Temik, has been withdrawn. There are also many negative perceptions surrounding some of the nematicides currently available. The South African Sugarcane Research Institute has been screening new products for use in the industry. During this process, a promising new product containing a combination of abamectin (nematicide) and thiomethoxam (insecticide) was identified. This study was aimed at evaluating the efficacy of this product against nematodes and thrips. Three plant crop and three ratoon trials were conducted between 2012 and 2014. Nematodes, thrips and yield were monitored. The product significantly reduced plant parasitic nematode numbers in the roots in both the plant crop and ratoon. Thrips numbers in the spindle were also significantly reduced. The use of the product increased cane yield (tc/ha) in five of the six trials. An average cane yield increase of 35% in the plant crop and 10% in the ratoon was noted. The product offers a single effective solution for the control of both thrips and nematodes and will soon be registered for use in the South African sugarcane industry.

Keywords: nematicide, nematodes, thrips, abamectin, thiomethoxam, yield

Introduction

Nematodes are a major production constraint in the South African sugar industry particularly on sandy soils. Spaull (1995) estimated that 1.6 million tons of cane are lost annually due to nematodes. Sugarcane thrips (*Fulmekiola serrata* Kobus) was first detected in the South African sugar industry in 2004 and since then has been associated with widespread damage in the industry (Leslie, 2005; Way *et al*., 2006; Abdel-Rahman *et al*., 2008; Way *et al*., 2010). With the withdrawal of Temik (the most widely used nematicide), SASRI began screening trials for alternative nematicides in 2012. During the screening process a product containing both a nematicide and insecticide was identified. The aim of this study was to evaluate the effect of this product on nematodes, thrips and yield.

Materials and Methods

Three plant crop trials, one each at Umfolozi, Port Edward and Darnall, were planted in September, October and November 2013, respectively. Three ratoon trials, one each at Darnall, Stanger and Gingindlovu were treated in October 2012, November 2012 and December 2013, respectively. The soil at each site contained <15% clay. All major plant parasitic nematode species affecting sugarcane were present and a variety rated as susceptible to nematodes was used. The trials contained an untreated control, Temik at 20 kg/ha and the product containing the active ingredients abamectin and thiomethoxam at 3 L/ha (1x) and 6 L/ha (2x). A fifth treatment (Bandit, a.i. imidacloprid) was applied in the plant crop trials and the ratoon trial at Gingindlovu. Treatments were applied either over the cane setts in the furrow at planting, or over the newly emerged cane within one month of harvesting. Each treatment was replicated six times in the plant crop trials and five times in the ratoon trials, and treatments were arranged in a randomised complete block design. Soil and root samples were collected for nematode analysis at 5, 6 and 8 months in all plant crop trials and 2, 3 and 6 months in all ratoon trials. Thrips samples were taken from all plant crop trials and the ratoon trial at Gingindlovu in January, February and March 2014. Samples for nematodes were taken later in the plant crop than in the ratoon to allow for the delay in root development. Due to the inherent variability of the nematode counts, data were analysed at the 10% significance level instead of 5%. The ratoon trials at Darnall and Stanger, conducted in 2013, did not focus on thrips, thus repeated sampling was not conducted in those trials. At harvest of each trial, each treatment was weighed and the estimated yield in tons cane per hectare was calculated. All data were subjected to analysis of variance using Genstat 14th edition. Data from all sites per crop stage were analysed together and all interactions were tested for. Where data were not normal, they were transformed using the square root transformation. Means were separated using the Sidak test.

Results and Discussion

The interaction between treatment and site was not significant for nematodes in the soil and roots, for thrips in the plant crop for all sampling times except January and cane yield in the ratoon (all treatments performed the same relative to the untreated control and to each other). In January, a significant interaction between treatment and site was obtained for thrips numbers. Similarly, in the plant crop, a significant interaction between treatment and site was obtained for yield. However, in both cases, despite the significant interaction, the two applied rates of the test product performed similarly relative to the untreated control. Means presented are therefore pooled data from all three sites.

No significant differences in nematode numbers in the soil were noted at any of the sampling times in both the plant crop and ratoon, except for Temik and the untreated control in the second sampling of the ratoon. In the roots, however, Product 1x reduced nematode numbers at all sampling times in the plant crop, and this difference was significant at the second sampling. No significant differences in nematode numbers were recorded between Product 1x and Temik in the plant and ratoon crops. In the ratoons, all treatments reduced nematode numbers in the roots, significantly so for Temik at all sampling times, Product 1x in the first sampling and Product 2x in the third sampling (Table 1).

All treatments significantly reduced thrips numbers in the plant crop compared to the untreated control at all sampling times. In the ratoon, Product 2x significantly reduced thrips numbers at all three sampling times. At the first two sampling times, Bandit significantly reduced thrips. There was no significant difference between Product 1x and Bandit at any of the sampling times in the plant crop and ratoon (Table 1).

A significant increase in yield was noted for Bandit, Product 1x and Product 2x in the plant crop trials and Temik in the ratoon trials, compared to the untreated control. In the plant crop, Product 1x yielded significantly higher than Temik (nematicide standard) but not Bandit (insecticide standard). There was no significant difference in yield between Temik and Product

1x and 2x in the ratoon (Figure 1). In addition, no significant difference was noted between Bandit, Product 1x and the untreated control at Gingindlovu (data not shown).

Table 1. Mean total number of plant parasitic nematodes in the soil and roots and thrips numbers ± standard errors of the mean. Means in columns followed by the same letter are not significantly different at the 10% significance level for nematodes and 5% significance level for thrips. Means are compared within sampling times.

Treatment	Sampling 1	Sampling 2	Sampling 3
Nematodes in soil (200 ml)			
Plant crop			
Control	$775^{a} \pm 145$	$1183^{a} \pm 285$	$834^{a} \pm 193$
Temik	$913^{a} \pm 169$	$988^{a} \pm 243$	$968^{a} \pm 134$
Product 1x	$915^{a} \pm 276$	$917^{a} \pm 172$	$908^{a} \pm 147$
Product 2x	$809^{a} \pm 182$	$1004^{a} \pm 184$	$1111^{a} \pm 225$
Ratoon			
Control	$398^{a} \pm 66$	$593^{ab} \pm 139$	$895^{a} \pm 209$
Temik	$348^{a} \pm 95$	$382^{a} \pm 79$	$975^{a} \pm 214$
Product 1x	$664^{a} \pm 165$	$714^{b} \pm 126$	$933^{a} \pm 235$
Product 2x	$534^{a} \pm 136$	$627^{ab} \pm 132$	$991^{a} \pm 207$
Nematodes in roots (per gram of root)			
Plant crop			
Control	$1677^{a} \pm 350$	$1535^{b} \pm 378$	$440^{a} \pm 110$
Temik	$1969^{a} \pm 528$	$855^{ab} \pm 196$	$392^{a} \pm 93$
Product 1x	$1154^{a} \pm 218$	$690^{a} \pm 192$	$351^{a} \pm 89$
Product 2x	$1076^{a} \pm 248$	$563^{a} \pm 109$	$473^{a} \pm 88$
Ratoon			
Control	$537^{b} \pm 152$	$184^{b} \pm 39$	$212^{b} \pm 55$
Temik	$96^{a} \pm 41$	$55^{a} \pm 19$	$83^{a} \pm 24$
Product 1x	$185^{a} \pm 45$	$157^{ab} \pm 41$	$120^{ab} \pm 29$
Product 2x	$222^{ab} \pm 59$	$167^{ab} \pm 34$	$92^{a} \pm 17$
Thrips numbers (per six spindles)			
Plant crop			
Control	$118^{c} \pm 14$	$102^{c} \pm 7$	$28^{c} \pm 2$
Bandit	$44^{b} \pm 6$	$37^{b} \pm 3$	$17^{b} \pm 2$
Product 1x	$43^{b} \pm 7$	$41^{b} \pm 5$	$13^{b} \pm 1$
Product 2x	$19^{a} \pm 3$	$15^{a} \pm 3$	$8^{a} \pm 1$
Ratoon			
Control	$66^{b} \pm 10$	$69^{b} \pm 8$	$13^{b} \pm 2$
Bandit	$29^{a} \pm 6$	$32^{a} \pm 3$	$11^{b} \pm 2$
Product 1x	$36^{ab} \pm 11$	$40^{ab} \pm 10$	$6^{ab} \pm 1$
Product 2x	$28^{a} \pm 8$	$18^{a} \pm 7$	$5^{a} \pm 1$

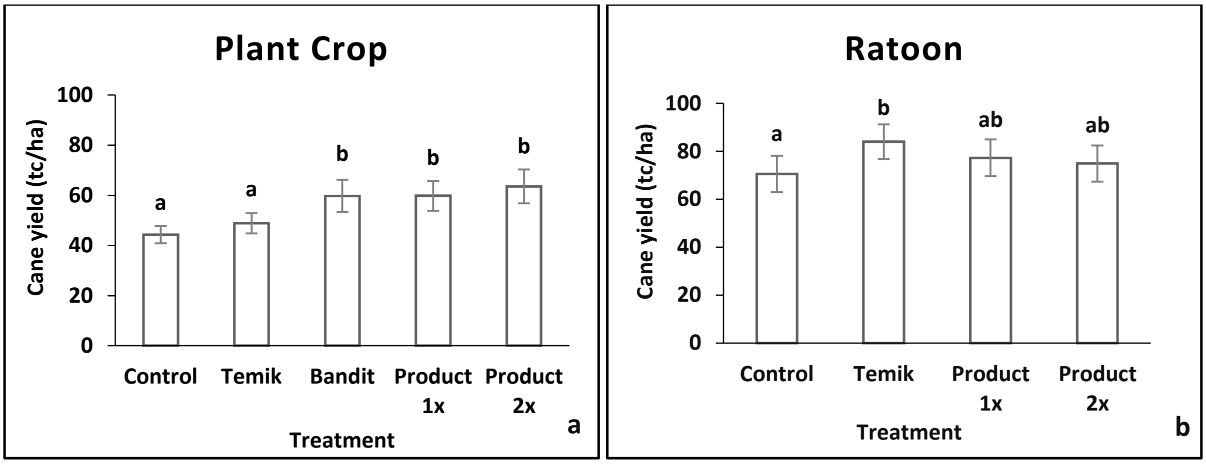

Figure 1. Mean cane yield (tc/ha) in (a) the plant crop (average of three trials) and (b) the ratoon (average of three trials) obtained at 12 months* after planting and/or treating. Bars represent standard error of the mean. Means with the same letter are not significantly different at the 5% significance level.

*The cane at the Port Edward plant crop trial was mistakenly harvested by the grower before yield could be obtained. Yield data in this trial was thus estimated based on the cane heights and stalk counts collected at 9 months. The ratoon trial at Stanger was harvested at 11 months.

The results from this study show that the tested product at the recommended rate is an effective nematicide and thripicide in the plant crop. It significantly reduced levels of the target pests and significantly increased yields. It also performed as well as Bandit and Temik and, in some cases, better than Temik. In the ratoon, the results were less marked; reductions in the target pests as well as increases in yields were noted, but these were not always significant. Further investigations in the ratoon crop are required.

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