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THE EFFECTS OF DIFFERENT PLANTING POPULATIONS AND CORRESPONDING SEEDING RATES ON CHICORY (*Cichorium intybus* L.) YIELD

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Introduction

Chicory (*Cichorium intybus* L.), belonging to the Asteracea family is a long-day, perennial and a tap rooted herb. In different countries, chicory is grown for a number of reasons however, in South Africa, chicory is grown mostly for the preparation of coffee powder whereby the roasted chicory is mixed with coffee beans. Chicory has small seeds, which are 1 mm in diameter, which together with poor planting practices, contribute to poor germination and plant stands resulting in poor yields. Balan EC (Benfluralin) is currently the only herbicide registered for weed control in chicory; however its action is limited to grass weed species. It is therefore a challenge for developing farmers to reach economic yields of 40 t ha⁻¹. The objectives of the study were to determine the optimal plant population as well as the optimal seeding rate under two weed management practices, a stale seed bed and pre-and post-emergence herbicides.

Materials and methods

The experiment was conducted at Cedara, C2 range five. A stale seed bed was achieved by applying Gramoxone approximately six and two weeks before planting the chicory. The pre-emergence herbicides; Dual S Gold EC and Hammer SL were applied one week prior to planting. Chicory seeds, (cv. Orchies) were planted mechanically at 4 kg ha⁻¹ using a hand planter. To acquire different plant populations, the inter-row plant spacing were adjusted by thinning seedlings to achieve plant populations of 83 333, 111

111, 166 666, 222 222 and 333 333 plants ha⁻¹. Seeds were also planted by hand to obtain the above plants per hectare. The post-emergence herbicides Gallant EC and Cysure SL were applied four weeks after thinning. Chicory roots were harvested 150 days after planting, average yield (t ha⁻¹), root mass (g), diameter (cm), length (cm) and total soluble solids (TSS) were evaluated.

Results

A plant population of 111 111 plants ha⁻¹ and a seeding rate of 333 333 seeds ha⁻¹, in combination with pre- and post-emergence herbicides obtained the highest chicory yields. A root yield of 8.08 t ha⁻¹ was achieved at a seeding rate of 333 333 seeds ha⁻¹ and 13 t ha⁻¹ was achieved at a plant population of 111 111 plants ha⁻¹. The application of pre- and post-emergence herbicides significantly affected root mass. Heavier roots were produced at different seeding rates compared to the different plant populations. The highest root mass of 342 g, was measured at a seeding rate of 166 666 seeds ha⁻¹, while at a plant population of 83 333 plants ha⁻¹, the highest root mass of 223.6 g was recorded. Root diameter was not significantly affected by the combined effects of sowing technique and weed management practice. However, the largest root diameter, greater than 5 cm, was found at a seeding rate of 166 666 seeds ha⁻¹ in combination with pre- and post-emergence herbicides. No significant differences were measured among the interactive effects of sowing technique and weed management practice on root length. The longest roots (18.46 cm) were obtained at a plant population of 333 333 plants ha⁻¹. Total soluble solids were not significantly affected by the interactive effects of sowing technique and weed management practice.

Conclusions

A plant population of 111 111 plants ha⁻¹ and a seeding rate of 333 333 seeds ha⁻¹, in combination with pre- and post-emergence herbicides obtained the highest chicory yields. The commercial plant population is 150 000 – 180 000 plants ha⁻¹. The intention of the trial was to increase both plant populations and seeding rates in order to obtain higher yields. However, this was not the case as yields obtained were below the economic target of 40 t ha⁻¹, possibly due the excessive plant populations and seeding rates, resulting in small and unmarketable roots. The application of Dual and Hammer, combined with Gallant and Cysure in this experiment had a beneficial effect on weed control, compared to the preparation of a stale weed seed bed using Gramoxone.