Effect of seaweed concentrate on yield and seed quality of *Arachis hypogaea*

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Pot trials were conducted to determine the effect of a commercially available seaweed concentrate on the yield of groundnuts. The concentrate was applied as a foliar spray at a dilution of 2 dm^3 ha^{-1} once (treatment 3) and twice (treatment 4) during the growing season. Overall seed mass of treated plants increased by 41% (treatment 3) and 65% (treatment 4) respectively. Maximum yield was obtained from those plants which received two applications of seaweed concentrate. These plants yielded the greatest number of seeds belonging to the large size category (53%) when compared to the controls (32%). The protein content of seed from treated plants was greater than that of the control. The lipid content however, showed no significant difference between treatments.

Pot-eksperimente is uitgevoer om die effek van 'n kommersieel beskikbare seewier-konsentraat op die opbrengs van grondbone te bepaal. Die konsentraat is as 'n blaarbespuiting teen 'n verdunning van 2 dm^3 ha^{-1} eenkeer (behandeling 3) of tweekeer (behandeling 4) gedurende die groeiseisoen aangewend. Die totale saad-massa van behandelde plante is met 41% (behandeling 3) en 65% (behandeling 4) onderskeidelik verhoog. Maksimale opbrengs is verkry met plante wat twee seewierkonsentraat-toedienings ontvang het. Sodanige plante het die grootste aantal sade wat tot die groot saad-kategorie behoort het gelewer (53%) in vergelyking met die kontrole-plante (32%). Die protein-gehalte van behandelde sade was hoër as die van kontrole-sade. Die lipied-gehalte is nie betekenisvol beïnvloed nie.

Keywords: *Arachis hypogaea*, cytokinins, groundnuts, seaweed concentrate

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Introduction

Data expressing the reproductive capacity of *Arachis hypogaea* L. plants has shown that only 13% of the total flowers (Smith 1954) and 30% of the total pegs produced (Patil & Chandamouli 1978) develop into mature pods. This, together with the fact that at the time of harvest the plant offers seed of different physiological maturity (Pattee *et al.* 1977) makes it essential that crop yield is maximized. In order to achieve this, foliar spraying of field crops with growth regulators, synthetic or natural has become common practice and has been shown to increase yield in a number of instances (Morgan 1977; Ries *et al.* 1978; Eriksen *et al.* 1982; Mishra *et al.* 1984; Nickell 1983). The effects of marine algal extracts and or concentrates on plant growth and yield has been the subject of a great deal of research in recent times. Ketring & Schubert (1981) using 'Cytex' a water soluble algal extract, recorded a significant increase in yield of 'Tamut 74' groundnut plants. The reasons for the yield increase recorded were attributed to the cytokinin content of the extract. Cytokinins have been detected in a number of seaweed extracts and/or concentrates (Brain *et al.* 1973; Featonby-Smith & Van Staden 1983a). The present paper deals with the response of groundnut plants (*Arachis hypogaea* L. var. Sellie) to seaweed concentrate (Kelpak 66) applied as a foliar spray on two occasions during the growing season. The seaweed concentrate used in this investigation is known to have a high cytokinin content (Featonby-Smith & Van Staden 1983a) and has elicited favourable yield responses in numerous crops (Featonby-Smith & Van Staden 1983a, b, 1984; Nelson & Van Staden 1984).

Materials and Methods

Groundnut plants of the Spanish variety Sellie were grown under normal summer conditions from December 1984 until April 1985. Seeds were planted three per 30-cm diameter plastic pot at a depth of 5–7 cm and thinned to one per pot 2 weeks after emergence of the seedlings. The potting medium used was sand:loam:compost (2:1:1) supplemented with 10 g 2:3:2 (N:P:K) fertilizer per pot. The pots were arranged in a randomized block design; each pot was placed ± 30 × 25 cm apart giving a plant density of 13,3 plants m^{-2}.

The experiment consisted of four treatments of 10 replicates each, these were (1) control; plants received 20 cm^3 water plus Tween 20 (0,25%) as a foliar spray 3 weeks after emergence of the seedlings, (2) control; plants received 20 cm^3 water plus Tween 20 (0,25%) as a foliar spray 3 weeks after emergence and again 8 weeks after emergence, (3) plants received 20 cm^3 seaweed concentrate (1:400) plus Tween 20 (0,25%) as a foliar spray 3 weeks after emergence, (4) plants received 20 cm^3 seaweed concentrate (1:400) 3 weeks after emergence and again 8 weeks after emergence of the seedlings. Each seaweed concentrate application was equivalent to 2 dm^{-3} ha^{-1}.

Plant material was harvested 150 days after planting. After harvesting, least significant differences ($p < 0,05$) for all data were calculated after performing an analysis of variance and the values expressed on a per plant basis.

The total protein content of seeds from various treatments was determined using a method adapted from Ballentine (1957). Samples were subjected to micro Kjeldahl digestion and analysed using a Technicon Autoanalyzer single channel calorimeter.

Lipids were extracted from seed tissue using a method adapted from Meara (1955). One-gram samples which had been previously dried to a constant mass were placed in a Soxhlet apparatus and the lipid extracted with light petroleum ether (boiling point 40–60°C) by percolating for 8 h. Subsequently, the thimbles were removed, dried in air in a desiccator and remassed. The mass lost from each thimble represented the mass of the petroleum ether soluble fraction.

Results

Plants which received two applications of seaweed concentrate, initially 3 weeks after emergence and again 8 weeks after emergence of the seedlings produced the most significant yield increases over the controls. Results presented in Table 1 show