

The effect of seaweed concentrate and fertilizer on growth and the endogenous cytokinin content of *Phaseolus vulgaris*

B.C. Featonby-Smith and J. van Staden

Department of Botany, University of Natal, Pietermaritzburg

The effect of foliar applications of a commercially available seaweed concentrate (Kelpak 66) on the growth and cytokinin content of *Phaseolus vulgaris* L. plants was investigated. Kelpak 66 at a dilution of 1:500 improved the growth of bean plants significantly irrespective of whether it was applied on its own as a foliar spray, or together with soil applications of a chemical fertilizer. Significant differences were also detected in the levels of endogenous cytokinins present in such treated plants. The cytokinin-like activity present in plants treated with seaweed concentrate was higher than in the control plants. Cytokinin glucosides were detected only in the fruits. The levels of these compounds were greatest in the fruits of plants which received both seaweed concentrate and fertilizer applications. The significance of these findings is discussed.

S. Afr. J. Bot. 1984, 3: 375-379

Die effek van blaarbespuiting van 'n kommersiële seewier-konsentraat (Kelpak 66) op die groei en sitokieninhoud van *Phaseolus vulgaris* L. plante is bestudeer. Kelpak 66 teen 'n verdunning van 1:500 het die groei van die boontjieplante betekenisvol verbeter ongeag of dit alleen aangewend is as 'n blaarbespuiting, of tesame met chemiese bemesting as 'n grondtoediening. Betekenisvolle verskille is ook gevind in die natuurlike sitokien-konsentrasies van sodanig behandelde plante. Die sitokienagtige aktiwiteit wat waargeneem is in seewier-behandelde plante was hoër as in die kontroleplante. Sitokien-glykosiede is slegs in die vrugte waargeneem. Hierdie tipe verbindings was teenwoordig in groter hoeveelhede in die vrugte van plante wat beide seewier en 'n chemiese misstof ontvang het. Die implikasies van hierdie resultate word bespreek.

S.-Afr. Tydskr. Plantk. 1984, 3: 375-379

Keywords: Cytokinins, *Ecklonia maxima*, *Phaseolus vulgaris*, senescence

Introduction

The beneficial effect of seaweed concentrate on the growth and yield of field crops (Blunden & Wildgoose 1977; Blunden *et al.* 1979; Featonby-Smith & Van Staden 1983a, 1983b) and the possible involvement of hormones, in particular cytokinins (Booth 1966; Blunden & Wildgoose 1977; Featonby-Smith & Van Staden 1983a, 1983b), is now well established. Until recently, however, no research has been conducted to determine the effect of seaweed concentrate, which is known to have a high cytokinin content (Featonby-Smith & Van Staden 1983a), on the endogenous levels of cytokinins within vegetative and reproductive organs of treated plants.

It is well documented that cytokinins are involved in nutrient mobilization in vegetative plant organs (Mothes & Engelbrecht 1961; Turrey & Patrick 1979; Gersani & Kende 1982). It has also been suggested that the presence of high levels of cytokinins in reproductive organs (Latham 1973; Davey & Van Staden 1977; Summons *et al.* 1980) may be associated with the mobilization process (Wareing & Seth 1967). Varga & Bruinsma (1974) reported that seeds and fruits or newly developing and morphologically changing organs have the potential to act as stronger sinks for cytokinins. This would mean that at certain stages of plant development the distribution of endogenous cytokinins, apparently synthesized in the roots, could be monopolized by a specific organ, thus creating preferential transport within the developing plant (Hutton & Van Staden 1984). Nooden & Leopold (1978) found that during fruit development the mobilization centre for photosynthate shifts away from the roots, stem, apex and young leaves to the developing fruit. Hutton & Van Staden (1984) found that at the fruiting stage the fruits contained high levels of cytokinin activity and that at this time biologically active components which co-chromatographed with glucosylzeatin were detected.

In an attempt to establish the effect of seaweed concentrate on the growth and endogenous cytokinin levels within *Phaseolus vulgaris* plants, Kelpak 66, a natural seaweed concentrate, was applied as a foliar spray with and without applications of a chemical fertilizer. Beans were used, as their endogenous cytokinins have been well studied (Wang *et al.* 1977; Wang & Horgan 1978; Palmer *et al.* 1981b).

Materials and Methods

Plant material

Plants of *Phaseolus vulgaris* L. (cv. Wintergreen) were grown under greenhouse conditions. Seeds were germinated in

B.C. Featonby-Smith and J. van Staden*

Plant Development Research Unit, Department of Botany,
University of Natal, Pietermaritzburg, 3200 Republic of South Africa

*To whom correspondence should be addressed

Accepted 1 August 1984