THE DIFFERENTIAL ROOTING RESPONSE OF TWO WINGED BEAN [*Psophocarpus tetragonolobus* (L.) DC.] GENOTYPES TO IBA TREATMENTS UNDER MIST

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Scientific Article No. A3531, Contribution No. 6605 of the Maryland Agriculture Experiment, Department of Horticulture.

ABSTRACT

Sub-terminal stem cuttings of two winged bean genotypes, PI 413214 and PI 413216 were treated with three levels of indolebutyric acid (IBA) and sampled after 15, 17, 19 and 23 days to examine rooting response. IBA treatment dramatically increased root dry weight, root length and root number in PI 413214 over time but had little effect on PI 413216. However, root characters had generally high values and rooting was faster in the latter at all IBA levels. Increases in root dry matter of the untreated cuttings appeared to be linear with time for both genotypes but their corresponding slopes at the three IBA concentrations were highly significantly different.

Ann. Trop. Res. 7: 21-26.

KEY WORDS: Winged bean. Rooting. Genotype. Indolebutyric acid.

INTRODUCTION

Winged bean, *Psophocarpus tetragonolobus* (L.) DC., is a valuable legume crop in the tropics and subtropics (Claydon, 1978; Lugo-lopez et al., 1981; Pospisil et al., 1971).

Propagation of the plant is normally by seeds (Csizinsky, 1980) but it may also be vegetatively propagated by stem cuttings (Lawhead et al., 1979). However, the latter method is preferred and often resorted to particularly when rapid and uniform clonal propagation of a single genotype is desired as in research or when seed supplies are limited or of uncertain genetic makeup. Treatment with 3000 ppm indolebutyric acid (IBA) followed by intermittent mist was found by Lawhead et al. (1979) to be effective in enhancing rooting of winged bean stem cuttings. In this experiment, the rooting response of stem cuttings of two winged bean accessions to IBA treatments under mist was examined.

MATERIALS AND METHODS

Seeds of winged bean accessions PI 413214 and PI 413216, which originated from Papua, New Guinea, were obtained from the U.S. Plant Introduction Station at Experiment, Georgia. These seeds were sown in 20-liter pots containing 40% peat, 40% loam and 20% perlite by volume. Plants were fertilized with Osmocote 14-14-14 slow release fertilizer at the rate of 15 g/pot and kept at a temperature of 24-30°C in a greenhouse located at College Park, Maryland (39°N).

Sub-terminal cuttings were taken from the upper portions of vines of four plants of each genotype. The vines were cut into 5 cm lengths leaving one trifoliate leaf per cutting. Cuttings were randomly selected, moistened with tap water, dipped to one-half their length in commercial IBA-talc preparations of either 1000 (Hormodin 1) or 3000 (Hormodin 2) ppm concentration, and placed in individual 75-mm plastic pots containing water-saturated grade no. 2 vermiculite. Control cuttings were placed directly in the water-saturated medium. Care was taken to prevent desiccation of all cuttings prior to sticking.

The experiment was laid out using the randomized complete block design. Three replications were maintained for each treatment and four sampling times which started at the first sign of rooting (on any cutting) and at 2, 4, and 8 days afterwards were used. The pots were placed under intermittent mist (30 seconds every 6 minutes) on a bench in the greenhouse at 18-24°C. As plants were removed at the different sampling dates (at 15, 17, 19 and 25 days after planting), the plants within the blocks were rerandomized to minimize adjacent plant effects. Root number, maximum root length, and root dry weight of each cutting were determined.

RESULTS

The two genotypes differed in root initiation and growth during the 23-day rooting period (Table 1). Although both accessions developed the same average number of roots per cutting, the maximum root length as well as the root dry weight of PI 413216 was about 3 times greater than those of PI 413214. This indicates that the difference in root mass between genotypes was due to differences in root length. PI 413216 also rooted earlier and produced root mass faster than PI 413214. The root dry weight increase of each genotype during the sampling period appeared to be linear with time but the corresponding slopes of the two accessions at the three IBA concentrations were highly significantly different.

The two genotypes also responded to IBA treatment differently (Table 1). While cuttings of PI 413214 responded well to IBA application in terms of significant increases in root number, mass and length, those of PI 413216 showed no statistically significant responses to IBA treatment.

Table 1. Rooting of winged bean, *Psophocarpus tetragonolobus* as affected by genotype and IBA concentration at 23 days after planting.[1]

Accession	IBA Concentration (ppm)			
	0	1000	3000	Mean
	Root Number/Plant			
413214	1.7a	4.7ab	49.3d	18.5a
413216	22.0c	15.0bc	19.0c	18.6a
Mean	11.9a	9.9a	34.1b	
	Root Dry Weight (mg)			
413214	1a	5a	71b	26a
413216	73b	66b	88b	76b
Mean	37a	36a	79b	
	Maximum Root Length (cm)			
413214	0.4a	0.6a	3.3b	1.4a
413216	4.4b	3.8b	4.5b	4.3b
Mean	2.4a	2.2a	3.9a	

[1]Means of each variable followed by a common letter are not significantly different at 5% level, DMRT.

DISCUSSION

Lawhead et al. (1979) found that stem cuttings of winged bean cultivars responded optimally to 3000 ppm IBA applied in the same manner as in this experiment. The results with accession PI 413214 concur with this finding but PI 413216 cuttings apparently does not need root-promoting treatment. Genotype differences within a species may be expected for these traits (Hartmann and Kester, 1975) but the magnitude of the interaction is unexpected. It is interesting to note that the root weight increase of accession PI 413214 cuttings treated with 3000 ppm IBA over time is nearly identical with that of untreated cuttings of accession PI 413216 (Fig. 1).

Mean rooting responses over time illustrate obvious differences in the progression of root length and number in the two genotypes (Fig. 1). Treatment with 3000 ppm IBA substantially increased root number and length over time in accession PI

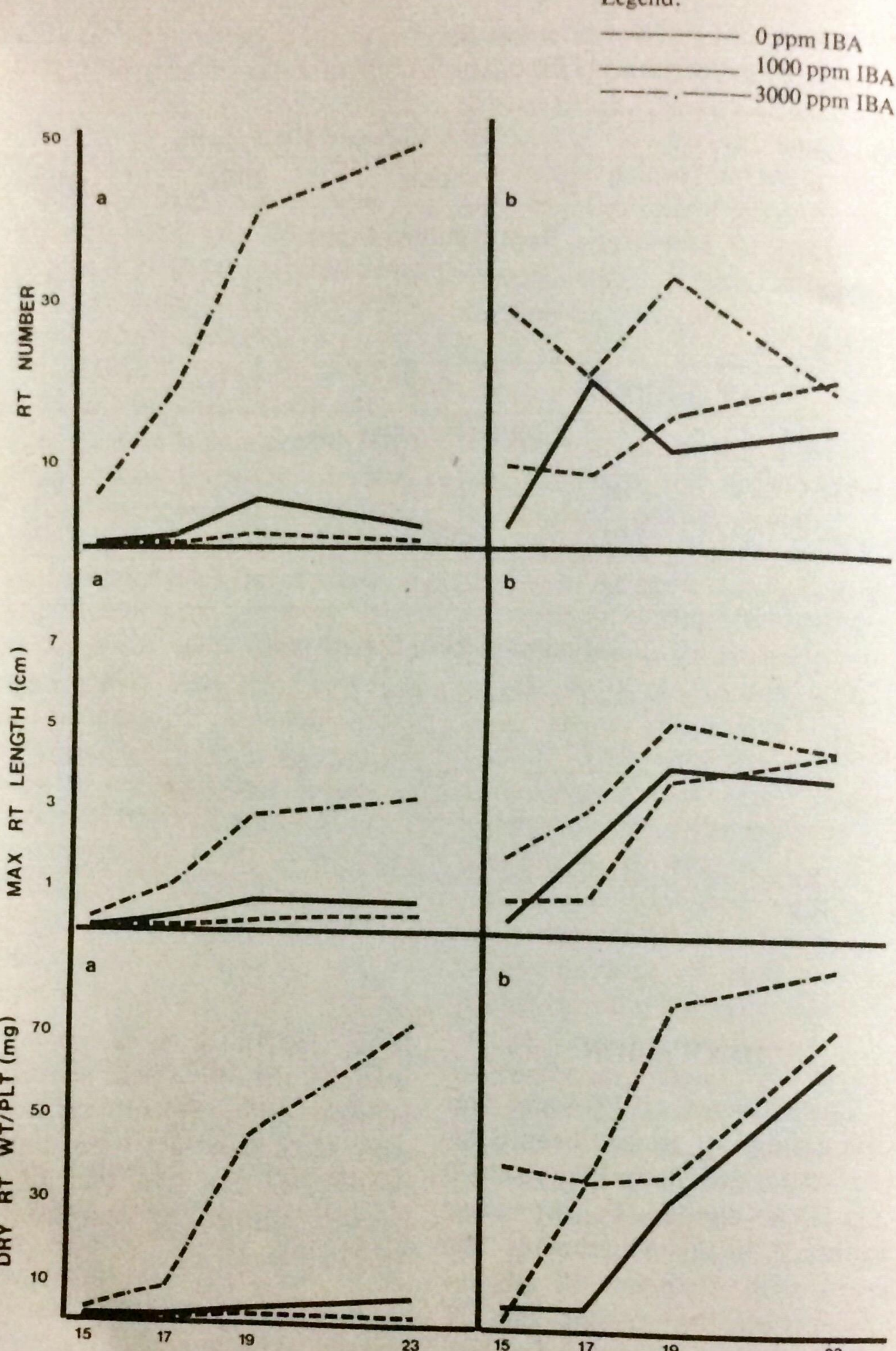

Figure 1. Increase in root number, maximum root length, and root dry weight per cutting of winged bean accessions PI 413214 (a) and PI 413216 (b) as affected by application of 0, 1000, and 3000 ppm of IBA.

413214 cuttings only. The number of roots in accession PI 413216 cuttings was high at the first sampling date but did not significantly increase over time.

Increase in root dry weight with time for the control groups was also markedly different between genotypes (Fig. 1). Root dry weight was generally low in cuttings of accession PI 413214 throughout the experimental period while it dramatically increased with time in accession PI 413216 cuttings.

These results suggest that the endogenous auxin levels in stems of accession PI 413216 may be close to the optimum level for rooting such that IBA application had no effect. On the other hand, the stems of accession PI 413214 had suboptimal auxin level and thus require IBA treatment to obtain satisfactory rooting. These differences should stimulate research that would seek to correlate this type of response with other morphological and physiological characters.

CONCLUSION

Stem cuttings of winged bean genotypes may not need rooting hormones to initiate rooting and produce substantial root growth. Differences in innate ability to produce roots indicate physiological differences, possibly due to endogenous auxin concentration gradients, which should be explored. The differences in the response of the two genotypes during the experimental period were primarily due to earlier rooting of one genotype. The differences may have been less at a later period if there was acceleration in the root growth of the slower genotype.

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