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WEED INTERFERENCE IN ARRACACHA (*Arracacia xanthorrhiza* Bancroft)

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ABSTRACT. Use of herbicides and hand weeding are common practices for weed control in root and tuber crops throughout the Caribbean Basin. In Puerto Rico, herbicides ametryn and paraquat are registered for use in some root and tuber production, but no herbicides are registered for arracacha. Knowing the time at which weeds begin to interfere with arracacha will permit optimum timing for weed control practices. The objective of this study was to determine the effects of various duration periods of weed interference on arracacha plant dry weight, stand and fresh corm yield. The study was established using periods of interference as treatments. Weeds were allowed to grow for 0, 1, 3, 5, 7, 11, and 40 weeks after transplanting. Plant dry weight was reduced linearly at a rate of 32 g/m^2 for each week of interference. Plants per hectare were reduced at a rate of 185 plants/ha for each week of interference. Analysis indicated a quadratic relationship between corm yield and lengths of weed interference.

INTRODUCTION

Use of herbicides and hand weeding are common practices for weed control in root and tuber crops throughout the Caribbean Basin. In Puerto Rico, herbicide ametryn and paraquat are registered for use in some root and tuber production, but no herbicides are registered for arracacha. In arracacha, weed control depends upon hand weeding. Under this system, weed control costs are high; thus the development of alternative control strategies would be advantageous and practical significance for farmers.

Arracacha has an eight-month long cropping cycle. Under such conditions weed population may succeed for more than one generation in a single crop cycle. In other root and tuber crops such as yam and tanier, weed interference all season long caused yield reduction of 47 and 94%, respectively, compared to yield of weed free plots (Liu *et al.*, 1980; 1994). The critical period of weed interference in yam is from the third to the forth month after planting (Cortés and Beale, 1984). In a preliminary study, Lugo and Acevedo (1997) determined that weed interference for five weeks after crop emergence caused 33% yield reduction in tanier.

In Puerto Rico, technical information regarding weed interference in arracacha is not available. Knowing the time at which weeds begin to interfere with arracacha permits optimum timing for weed control. The objective of this study was to determine the effects of various duration periods of weed interference on arracacha plant dry weight, stand and fresh corm yield.

MATERIALS AND METHODS

The study was established at the Agricultural Experiment Station (AES) at Adjuntas in January 1998. The soil was from the Toa Series (Mollisols) with a pH 6.05 and 1.44 % of organic matter. A randomized complete block design with four replications was used. The traditional landrace Criolla was used in this study. To assure a complete stand, preemerged corm buds were transplanted into the field. Each plot had three rows spaced 0.91 m apart. Planting distance was 0.61 m between plants within the row. Plots were 3.06 m wide and 3.04 m long. Crop management followed standard recommendations (U.P.R., 1997). Treatments were periods of interference. Weeds were allowed to grow for 0, 1, 3, 5, 7, 11 and 40 weeks after transplanting. After each period of interference, weeds were removed as needed until harvest. At 54 days after transplanting, twelve 0.30 m^2 quadrats were randomly thrown within the plot. Weeds within the quadrants were identified and counted to estimate weed density. A month before harvest, two plants per plot was removed to determine plant dry weight. Plants were dried in a greenhouse for four weeks. Plant dry weight was expressed in g/m^2. Harvest was performed 10 months after planting. At harvest the number of plants per plot was determined and expressed as plants per hectare. Yield was recorded as fresh weight and expressed in kg per hectare.

Regression analyses were conducted to associate changes in plant dry weight, plants per hectare and yield with weeks of weed interference. In these analyses the number of weeks of weed interference was the independent variable.

RESULTS

The average total weed density in the experimental plots was 161 plants/m^2. The most common weeds were *Lepidium virginicum*, *Galinsoga spp.*, *Eleusine indica*, and *Echinochloa colona* with densities of 48, 40, 13, and 10 plants/m^2, respectively.

Plant dry weight, plants per hectare and corm yield was reduced as the period of weed interference increased. The relationship between plant dry weight and weeks of interference was negative and significant (Table 1) Plant dry weight was reduced linearly at a rate of 32 g/m^2 for each week of interference. Interference of zero (no interference) to 40 weeks reduced plant dry weight from 2,089 to 803 g/m^2. As for plant dry weight, the relationship between plants per hectare and weeks of interference was linear (Table 1). Plants per hectare were reduced at a rate of 185 plants/ha for each week of interference. Analysis indicated a quadratic relationship between corm yield and period lengths of weed interference (Table 1). Weed interference from zero to 40 weeks after crop emergence reduced yield from 8,148 to 1,040 kg/ha.

Results indicate that arracacha is sensitive to early weed interference. Dry weight, number of plants per unit of area, as well as fresh corm yield, is sensitive to weed interference. Similar responses have been reported for tanier and yam (Lugo and Acevedo, 1997; Cortés and Beale, 1984)).

Table 1.Regression equations for plant dry weight, plant number and arracacha yield with week of weed interference.

	Regression Equation[a]			R^2
Dependent Variable (Y)	Intercept (B_o)	Slope Weeks (X)	SlopeWeeks $(X)^2$	
Plant dry weight (g/m^2)[a]	2089.7*	-32.2*		0.21
Plant (plant/ha)[b]	10560.0*	-185.5*		0.20
Corm fresh weight (kg/ha)[c]	8148.2*	-556.7*	9.48*	0.47

*indicates significance.

[a] $Y = B_o + B_1 X$, where Y = plant dry weight, B_o = intercept, B_1 = slope and X = week of weed interference.

[b] $Y = B_o + B_1 X$, where Y = plant per hectare, B_o = intercept, B_1 = slope and X = week of weed interference.

[c] $Y = B_o + B_1 X + B_1 X^2$, where Y = arracacha weight (yield), B_o = intercept, B_1 = slope, B_1X^2 = slope^2 and X = week of weed interference.

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