

Research Note

EGGPLANT (*SOLANUM MELONGENA* L.) TRANSPLANTS AND EXUDATES FROM ROOTS OF SEVEN WEEDS^{1,2}

Weeds are a constraint to eggplant production. Weed interference (competition and allelopathy) affects crop yields and quality. Allelopathy is any direct or indirect effect, beneficial or detrimental, induced by one plant to another by producing and releasing chemical substances in the environment.³ Allelochemical sources are leaves, roots and plant litter; substances are released from living leaves as volatiles or leachates and from roots through exudates or sloughing of dead tissues.⁴

In 1985, a greenhouse experiment was conducted at the Lajas Agricultural Experiment Station, University of Puerto Rico to determine possible allelopathic effects of 7 weed species prevalent in eggplant plantations. Root exudates of the following weed species were examined: *Parthenium hysterophorus* L., *Echinochloa colonum* L., *Amaranthus dubius* Mart., *Sorghum halepense* (L.) Pers., *Euphorbia heterophylla* L., *Rottboellia exaltata* L., and *Trianthema portulacastrum* L. Weed seedlings, about 15 cm in height (3 true leaves), were transplanted 10 July 1985 to a system consisting of PVC drain pipes and fittings for collecting root exudates for this study.^{3,5}

Seeds from eggplant cv. Rosita were sown in flat metal pans 10 July 1985; 4 weeks later two seedlings per pot were transplanted to 12-cm diameter plastic pots. A mixture (1:1:1 v/v) of perlite, vermiculite and washed river sand was used as planting medium. Weed and eggplant seedlings were watered with a dilute nutrient solution (20-20-20: N, P₂O₅, K₂O) of 1 tablespoonful/gal water daily, starting 9 August 1985. Three days later, weed root exudates were collected and applied to the growth medium of the eggplant transplants at 60 cm³ per pot. For each weed species, three exudate treatments, replicated three times, were established: no exudates added (tap water plus nutrient solution only); exudates applied on 3 alternate days (Monday, Wednesday, Friday); and exudates for 5 consecutive days, Monday through Friday, for 6 consecutive weeks.

At the beginning of the experiment, the height of the eggplant seedlings was recorded. On September 23, final height and fresh weights were taken. To obtain dry weights we then oven dried plants at 60° C for a 24-h period.

Table 1 summarizes the effects of the weed root exudates on eggplant height and

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²Research conducted by Carmen D. Guzmán as partial requirement, M.S. thesis, Crop Protection Department, Univ. P. R., Mayagüez Campus.

³Pope, D. F., A. C. Thompson and A. W. Cole, 1985. Phytotoxicity of root exudates and leaf extracts of nine plant species. ACS Symposium Series 268, The Chemistry of Allelopathy, American Chemical Society, Washington, D.C. pp. 219-34.

⁴Putnam, Alan R., 1983. Allelopathic chemicals, C&N Special Report, American Chemical Society, Washington, D.C. pp. 34-5.

⁵Almodóvar, L., C. D. Guzmán and N. Semidey, 1988. Allelopathic effects of seven weed species to pumpkin (*Cucurbita moschata*) under greenhouse conditions. Research Note. *J. Agric. Univ. P. R.* 72 (3): 00.

TABLE 1.—*Effect of root exudates from various weeds on plant height and dry weight of eggplant (Solanum melongena) cv. Rosita*

Treatment ²	Weeds ¹						
	PTNHY	ECHCO	AMADU	SORHA	E-HAL	ROOEX	TRTPO
	<i>Height (cm)³</i>						
0	70.6 a	70.6 a	70.6 a	70.6 a	70.6 a	70.6 a	60.6 a
3	53.8 b	54.9 b	49.3 b	52.1 b	57.6 b	57.9 b	53.0 b
5	44.7 b	52.1 b	44.5 b	55.1 b	55.0 b	57.4 b	50.1 b
	<i>Dry weight (g)³</i>						
0	65.9 a	65.9 a	65.9 a	65.9 a	65.9 a	65.9 a	65.9 a
3	41.3 b	40.2 b	38.9 b	40.2 b	52.2 b	53.9 b	45.2 b
5	39.0 b	38.5 b	37.9 b	42.3 b	51.0 b	52.1 b	42.3 b

¹PTNHY = *Parthenium hysterophorus*, ECHCO = *Echinochloa colonum*, AMADU = *Amaranthus dubius*, SORHA = *Sorghum halepense*, EPHAL = *Euphorbia heterophylla*, ROOEX = *Rottboellia exaltata* and TRTPO = *Trianthema portulacastrum*.

²0 = no exudate added; 3 = exudates applied in 3 alternate days; 5 = exudates applied for 5 consecutive days for six weeks.

³Average of three replications: Values in columns followed by the same letters do not differ significantly at P=0.05, Duncan's multiple range test.

dry weights. The addition of root exudate solutions 3 or 5 days per week for 6 weeks significantly reduced the seedling height. No statistical differences (P=0.05) were observed between these two treatments. The

check treatment plants (no exudates added) were the tallest, 70.6 cm, statistically taller than plants treated with root exudates from the different weeds. Root exudates applied on 3 alternate days caused plant height vari-



FIG. 1.—To the right, eggplant transplants treated with root exudates from *Amaranthus dubius*. Exudates applied for 5 consecutive days affected plant height and dry weight more severely than the 3 alternate day-treatment.



FIG. 2.—To the right eggplants treated with root exudates from *Rottboellia exaltata*. Exudates applied for 3 alternate days affected dry weight and plant height less than the 5-day treatment.

ations from 49.3 cm (*A. dubius*) to 57.9 cm (*R. exaltata*); when exudates were applied 5 consecutive days, plant heights ranged from 44.5 cm (*A. dubius*) to 57.4 cm (*R. exaltata*). Figures 1 and 2 present comparative plant heights of check treatments vs. weed exudate treatments with *A. dubius* and *R. exaltata*.

The plants in the check treatment were the heaviest, averaging 65.9 g. This dry weight is statistically greater than that of eggplant seedlings treated with root exudates. The dry weight of 3 alternate day-treatments ranged from 38.9 g (*A. dubius*) to 53.9 g (*R. exaltata*). Plant weights of the 5 consecutive day treatments ranged from 37.9 g (*A. dubius*) to 52.1 g (*R. exaltata*). No statistical differences in dry weights

were established between the 3- and the 5-day per week exudate treatments.

The study indicates that all weed species evaluated caused adverse allelopathic effects on eggplant seedlings through decreased plant growth (stem length and dry weight). Chemical analyses of root exudates are needed to determine the allelochemicals involved. Also, additional studies with other weeds present in eggplant fields will be of great value in better understanding the nature of allelopathy.

Luis Almodóvar-Vega
Carmen D. Guzmán-Pérez
Nelson Semidey-Laracuenté
Department of Crop Protection

