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WEED MANAGEMENT IN SOLANACEOUS CROPS IN THE DOMINICAN REPUBLIC

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ABSTRACT. A technological summary on the current weed control practices in solanaceous crops (processing and fresh tomato, peppers, eggplant, potato and tobacco) in the Dominican Republic was compiled based on information supplied by state agencies, private agrochemical companies and growers. According to the data collected, weed management systems integrating chemical and physical (cultivation and hoeing) practices are predominant in processing tomato and potato, whereas cultivation and hoeing are more common in fresh tomato, eggplant, peppers and tobacco. The cost of weed management as a percentage of the total crop production cost averaged 5-10% for potato, 7-15% for peppers, 10-13% for fresh tomato, 10-14% for tobacco, 12% for processing tomato and 15-20% for eggplant. Weed species associated with these crops were abundant, the most troublesome species were: *Cyperus rotundus*, *Parthenium hysterophorus* and several grass species in eggplant, processing and fresh tomato; *Cyperus rotundus*, *Sida acuta*, *Parthenium hysterophorus* and grass species in peppers; *Cynodon dactylon*, *Cyperus esculentus* and *Cyperus rotundus* in potato; *Amaranthus* spp., *Cleome viscosa* and several grass species in tobacco. The most commonly used herbicides are metribuzin and fluazifop-buthyl in tomatoes, fluazifop-buthyl in peppers and eggplant, linuron, metolachlor, paraquat and ametryn in potato. Herbicide utilization in tobacco is not significant. The number of cultivations and/or hoeings ranged from 1 to 4, depending on the crop species and the early use of herbicides. Yield losses due to weed interference under field conditions is estimated to be 25-35% in eggplant and tobacco, 25-50% in potato, 30-40% in processing and fresh tomato, and 40-50% in peppers.

INTRODUCTION

In the Dominican Republic, the main solanaceous crops are tomato (*Lycopersicon esculentum*), potato (*Solanum tuberosum*), peppers (*Capsicum* spp), eggplant (*Solanum melongena*) and tobacco (*Nicotiana tabacum*). The approximate area annually dedicated to the production of this group of crop species is 39000 hectares nationwide. Processing tomato is grown predominantly in the semiarid regions of the South, Center and Northwest, fresh tomato is grown mostly in the both the high and lowlands of the Southcentral region, potato is produced mainly in the cool highland valleys and tobacco production is concentrated in the Cibao Valley. Eggplant and peppers are produced mostly in the Southern and Northcentral plains.

All these crops require intensive management for successful production, especially so in terms of plant protection. Although the negative impact of weeds on crops is not as readily noticed as that of diseases, insects, mites and other pests, yield reductions resulting from weeds can be substantial. Yield loss due to the interference of unchecked or poorly managed weeds in solanaceous crops in the Dominican Republic has been estimated to be between 25 and 50%, reaching even 80 and 100% in observed extreme cases. This paper is intended to present a summary of the common current practices of weed management in fresh and

processing tomato, peppers, eggplant, potato and tobacco in the Dominican Republic.

Processing tomato: Practically 100% of the commercial processing tomato is produced either by the processing companies directly or by private growers that produce tomato for these companies under contract. Such contracts include a package of financial and technical aid for the growers, making processing tomato production systems highly uniform. It is estimated that 95% of the growers use metribuzin PRE for early weed control and cultivation prior to flowering to suppress escaping weeds, to reshape the soil beds and to incorporate a second nitrogen application. It is also estimated that out of the 95% of growers using metribuzin, a 3% also utilizes POST grass materials (fluazifop-buthyl) near the middle of the crop season. In approximately 5% of the plantations (transplanted tomato) PRE mixtures of metolachlor and metribuzin are used one week after transplanting, eliminating the need for mechanical cultivation.

Production area	10,000 ha
Area in which weeds are controlled by physical means only	1%
Area in which weeds are controlled by chemical and physical means	99%
Weed control as a % of total production cost	12%
Weeds commonly associated with the crop	Cyperus rotundus Cenchrus echinatus, Cynodon dactylon, Digitaria sanguinalis, Echinochloa colona, Eleusine indica, Rottboellia exaltata Amaranthus spp., Boerhavia erecta, Cleome viscosa, Euphorbia heterophylla, Sida acuta, Phyllanthus spp., Parthenium hysterophorus, Portulaca oleracea
Weeds considered troublesome	Cyperus rotundus, grasses, Parthenium hysterophorus
Chemical treatments commonly used	PRE: Metribuzin POST: Fluazifop-buthyl
Physical control practices	One cultivation and nitrogen fertilization before crop flowering
Estimated yield loss due to weed interference	30-40% Known extreme cases up to 80%

TERMINOLOGY

- **Production area:** It is the official estimate of the surface area planted nationwide for a given crop.
- **Physical control:** It includes the use of cultivation, hoeing and hand-pulling of weeds.
- **Chemical control:** It implies the use of commercial herbicides.
- **Weed control as a percentage of total production cost:** Values for weed control costs were derived from official data obtained from the "Banco Agrícola de la Republica Dominicana" (the State Agricultural Bank), data supplied by local agrichemical companies and by actual expenses reported by growers.

- Weeds commonly associated with the crops: Compiled from direct field observations, previous weed occurrence reports and personal communications from Dominican growers and weed scientists.
- Weeds considered troublesome: Based on abundance, difficulty of control and resulting yield losses.
- Chemical treatments commonly used: Preemergence treatments (PRE) refers to herbicide application before weed emergence. Postemergence treatments (POST) are applied after weeds have emerged.
- Physical control practices: Frequency and nature (cultivation, hoeing) of weed management activities implemented after crop establishment, and accompanying cultural practices (soil bed reshaping and fertilization) performed simultaneously.
- Estimated yield losses due to weed interference under local conditions: Derived from direct field evaluations and personal communications from Dominican growers and weed scientists.

Fresh tomato: Tomato for fresh or salad consumption is grown nationwide, although production areas are more concentrated in the Northcentral and Southern regions. In most cases, production plots do not exceed 2 ha, and growers tend to perform cultural practices manually. Thus, hoeing is a preferred means of weed control in fresh tomato.

Production area	800 ha
Area in which weeds are controlled by physical means only	60%
Area in which weeds are controlled by chemical and physical means	40%
Weed control as a % of total production cost	10% (physical control only) 13% (physical and chemical)
Weeds commonly associated with the crop	<i>Cyperus rotundus</i> <i>Cenchrus echinatus</i> , <i>Cynodon dactylon</i> , <i>Digitaria sanguinalis</i> , <i>Echinochloa colona</i> , <i>Eleusine indica</i> , <i>Rottboellia exaltata</i> <i>Amaranthus</i> spp., <i>Boerhavia erecta</i> , <i>Cleome viscosa</i> , <i>Euphorbia heterophylla</i> , <i>Sida acuta</i> , <i>Phyllanthus</i> spp., <i>Parthenium hysterophorus</i> , <i>Portulaca oleracea</i>
Weeds considered troublesome	<i>Cyperus rotundus</i> , <i>Parthenium hysterophorus</i> , most grasses.
Chemical treatments commonly used	PRE: Metribuzin POST: Fluazifop-buthyl. In the highland area of Ocoa, repeated (up to 4 times per season) shielded applications of paraquat are used in 30% of the area.
Physical control practices	When PRE metribuzin is used, the crop is hoed once at the beginning of flowering, incorporating a second nitrogen application. When PRE metribuzin is not used, up to 4 hoeings are performed.
Estimated yield loss due to weed interference	30-40%

Peppers: A variety of pepper types are commercially grown in the Dominican Republic, including Cubanelle, Scott bonnet (“Cachucha”), hot and bell peppers. Weeds are controlled by cultivation and hoeing. Chemical control is restricted to POST grass materials (mainly fluazifop-buthyl) in fields where grass weeds are abundant. Fields managed by processing and/or exporting companies and growers producing for these enterprises are more likely to use chemical herbicides than the more abundant but less extensive private growers, who usually rely on hoeing crews.

Area under production	700 ha.
Area in which weeds are controlled by physical means only	70%
Area in which weeds are controlled by chemical and physical means	30%
Weed control as a % of total production cost	Hoeing: 7% (Northcentral region), 13% (Central region), 15% (South and Southwest regions). Chemical and physical: 7-15%, depending on the region
Weeds commonly associated with the crop	Cyperus rotundus Cenchrus echinatus, Cynodon dactylon, Digitaria sanguinalis, Echinochloa colona, Eleusine indica, Rottboellia exaltata Amaranthus spp., Boerhavia erecta, Cleome viscosa, Euphorbia heterophylla, Sida acuta, Phyllanthus spp, Parthenium hysterophorus, Portulaca oleracea
Weeds considered troublesome	Cyperus rotundus, Sida acuta, Parthenium hysterophorus, most grasses.
Chemical treatments commonly used	PRE: none POST: fluazifop-buthyl
Physical control practices	In bell pepper usually 2 or 3 hoeings at 15 day intervals. In Cubanelle, hot and “Cachucha” usually 2 to 4 hoeings. Postgrass material applications make up for 1 or 2 cultivations. A second nitrogen application is incorporated with hoeing or cultivation.
Estimated yield loss due to weed interference	40-50%

Eggplant: Eggplants are grown in relatively small fields (about 2 ha), mostly in the Southern half of the country. In eggplants, like in peppers, hoeing and POST grass materials are the preferred means for weed control. Napropamide is safe for use in eggplant, but it is seldom utilized.

Production area	650 ha.
Area in which weeds are controlled by physical means only	95%
Area in which weeds are controlled by chemical and physical means	5%
Weed control as a % of total production cost	15-20 % (physical) 15% (chemical and physical)
Weeds commonly associated with the crop	Cyperus rotundus Cenchrus echinatus, Cynodon dactylon, Digitaria sanguinalis, Echinochloa colona, Eleusine indica, Rottboellia exaltata Amaranthus spp., Boerhavia erecta, Cleome viscosa, Euphorbia heterophylla, Sida acuta, Phyllanthus spp., Parthenium hysterophorus, Portulaca oleracea
Weeds considered troublesome	Most grasses, Cyperus rotundus, Parthenium hysterophorus
Chemical treatments commonly used	PRE: none POST: fluazifop-butyl
Physical control practices	3 or 4 hoeings per season. A second nitrogen application is incorporated with hoeing before crop flowering.
Estimated yield loss due to weed interference	25 to 35%

Potato: In the Dominican Republic, potato is grown mainly in the highlands (800-1800 meters above sea level) of the Central Mountain Range. In those areas, integrated system of chemical herbicides, cultivation and hoeing for weed control are common. Marginal production of potato occurs in areas of lower altitude, in which hoeing and cultivation are more commonly used for weed control. In spite of a wide selection of herbicides that could be safely used in both lowlands and highlands (fluazifop-butyl, diuron, terbutryn, pendimethalin, alachlor), chemical control is based primarily on the utilization of ametryn, linuron, metolachlor and paraquat.

Production area	2,200 ha
Area in which weeds are controlled by physical means only	1%
Area in which weeds are controlled by chemical and physical means	99%
Weed control as a % of total production cost	Physical: 5-7 % (Central and Northcentral regions), 9 % (Southern region) Chemical and physical: 10 % Northcentral and Central regions)
Weeds commonly associated with the crop	In highlands: Cyperus esculentus, Cyperus rotundus, Cynodon dactylon, Digitaria ciliaris, Echinochloa colonum, Eragrostis tephrosanthos, Setaria lutescens, Setaria verticillata. Amaranthus spp., Bidens pilosa, Brassica spp., Chenopodium album, Commelina diffusa, Cynoglossum amabile, Galisonga parviflora, Lepidium virginicum, Mollugo verticillata, Parthenium hysterophorus, Portulaca oleracea, Sonchus oleraceus, Stellaria media. In lowlands: Cyperus rotundus Cenchrus echinatus, Cynodon dactylon, Digitaria sanguinalis, Echinochloa colona, Eleusine indica, Rottboellia exaltata. Amaranthus spp., Boerhavia erecta, Cleome viscosa, Euphorbia heterophylla, Sida acuta, Phyllanthus spp., Parthenium hysterophorus, Portulaca oleracea.
Weeds considered troublesome	Cyperus esculentus, Cyperus rotundus, Cynodon dactylon.
Chemical treatments commonly used	PRE: Mixture of linuron and metolachlor POST: (1) paraquat once or twice, after potato is planted but before it emerges; (2) ametryn one week after planting potato tubers and before they sprout. Ametryn and paraquat are sometimes mixed and applied before potato emerges. Vine dissecant: Paraquat
Physical control practices	Highland: To complement chemical treatments, 1 or 2 cultivations or hoeings before the crop canopy closes. Lowlands: 2 or 3 hoeings.
Estimated yield loss due to weed interference	25-50%

Tobacco: In the Dominican Republic, tobacco is a crop of tradition, a family crop usually grown in plots of up to 3 ha. Family members perform most of the tasks necessary to grow the crop, including weed control. Because of this, in most cases weeds are controlled by physical means. POST grass materials are sometimes used. Herbicides such as napropamide, pebulate and pendimethalin have been tested and their use recommended, but currently the area of tobacco fields in which these herbicides are utilized is not significant.

Production area	25,000 ha
Area in which weeds are controlled by physical means only	99%
Area in which weeds are controlled by chemical and physical means of control	1%
Weed control as a % of total production cost	10 % (Northwest region) 14 % (Southwest region)
Weeds commonly associated with the crop	Cynodon dactylon, Digitaria ciliaris, Echinochloa colonum, Eleusine indica, Leptochloa filiformis, Panicum spp., Sorghum halepense, Rottboellia exaltata, Amaranthus spp., Boerhavia erecta, Cassia spp., Cleome viscosa, Euphorbia heterophylla, Portulaca oleracea, Sida acuta
Weeds considered troublesome	Grasses, Amaranthus spp., Cleome viscosa
Chemical treatments commonly used	PRE: none POST: Fluazifop-buthyl (1% of total area)
Physical control practices	2 or 3 hoeings
Estimated yield loss due to weed interference	25-35%

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