Chapter VIII
Summary

According to our research, mesotrione will be an important addition to corn weed management programs currently used in the Mid-Atlantic region. However, preemergence (PRE) applications of mesotrione were inconsistent and depended on timely rainfall after application and tank-mixtures with acetochlor and atrazine for improved weed control. Also, mesotrione was more effective as a PRE herbicide when applied in no-till compared to conventional tillage corn. Therefore, the most consistent weed control and highest corn yields generally occurred when mesotrione or atrazine was applied in tank-mixture with acetochlor followed by mesotrione postemergence (POST). These treatments generally controlled broadleaf weeds and giant foxtail greater than 80%.

Mesotrione has controlled most weed species better when applied POST than when applied PRE. Mesotrione applied POST controlled common lambsquarters (*Chenopodium album* L.) and smooth pigweed (*Amaranthus hybridus* L.), but did not always control morningglory species, common ragweed, and giant foxtail. In other studies, mesotrione POST controlled other broadleaf and grass weeds such as, hemp sesbania (*Sesbania exaltata* (Raf.) Rydb. ex A.W.Hill), jimsonweed (*Datura stramonium* L.), spurred anoda [*Anoda cristata* (L.) Schlecht.], velvetleaf (*Abutilon theophrasti* Medicus), wild radish (*Raphanus raphanistrum* L.), wild mustard [*Brassica kaber* (DC.) L.C. Wheeler], henbit (*Lamium amplexicaule* L.), carpetweed (*Mullugo verticillata* L.), volunteer potato (*Solanum tuberosum* L.), large crabgrass [*Digitaria sanguinalis* (L.) Scop.], red rice (*Oryza sativa* L.), and barnyardgrass [*Echinochloa crus-galli* (L.) Beauv.]. Prickly sida (*Sida spinosa* L.), sicklepod (*Cassia obtusifolia* L.), common ragweed (*Ambrosia artemisiifolia* L.), morningglory species (*Ipomoea* spp.), yellow foxtail [*Setaria glauca* (L.) Beauv.], and broadleaf signalgrass [*Brachiaria platyphylla* (Griseb.) Nash.] were controlled when mesotrione was applied POST with a low rate of atrazine. In fact, mesotrione plus atrazine combinations increased the rate of plant tissue necrosis as compared to the slower meristematic bleaching associated with mesotrione alone. This increased control and the change in symptomology associated with mesotrione plus atrazine was also observed in the perennial weeds horsenettle (*Solanum carolinense* L.), Canada thistle [*Cirsium arvense* (L.) Scop.], yellow nutsedge (*Cyperus esculentus* L.), purple nutsedge (*Cyperus rotundus* L.), and common mugwort (*Artemisia vulgaris* L.). This enhanced weed control with mesotrione plus atrazine was not explained by absorption, translocation, or metabolism studies with Canada thistle, but may be explained by the interrelationship between the modes of action of triketone and triazine herbicides. Mesotrione should be further evaluated in POST combinations with other Photosystem II inhibitors to determine if these combinations will produce similar effects.

PRE and POST applications of mesotrione were safe to non-herbicide resistant and imidazolinone-resistant corn hybrids. However, high levels of injury were observed after POST applications in glyphosate-resistant corn. Although injury was transient and did not affect yields, this type of injury may not be commercially acceptable. However, due to its novel mode of action and residual activity mesotrione should be an effective component of POST weed control programs in non-genetically modified and herbicide-resistant corn hybrids. Further research should include total POST combinations of mesotrione with atrazine and POST grass herbicides for full-season broad-spectrum weed control in corn.