

Problematic weeds and management challenges for onion production in the Imperial Valley

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Onion (*Allium cepa* L.) is a biennial crop by nature, but it is grown primarily as an annual crop for harvesting leaf and bulb. It is relatively a slow-growing and long-season crop, has narrow and upright leaves, and a shallow root system. California's low desert region is one of the primary areas for onion production. Onion is an important crop for Imperial County and it was ranked the fourth agricultural commodity, after cattle, alfalfa, and leaf lettuce in 2016, respectively. If we look at the crop value, market and processing onion was harvested from 4,000 and 10,000 acres with the gross value of \$61.4 and \$67.1 million, respectively, in 2016.

Onion yield loss from weeds

One of the major yield limiting factors for onion production is pest infestation. Weeds are serious pests for onion and yield primarily depends upon the severity of weed infestation during the crop's growing season. Onion leaves are narrow and upright which makes it less competitive to weeds. Weeds can establish and outcompete onions for water, nutrients, sunlight and other resources essential for crop growth. Onion is very susceptible to weed interference at about one- to three-leaf stage. If weed control is not effective, yield will be reduced significantly depending upon the weed pressure. For green onions, the season-long weed interference can result about 96 percent yield reduction. In bulb onions, weed interference for the entire growing season can reduce more than 50 percent crop stand. Weed interference can also delay fall-over of the onion tops, increase percentage of thick-necked onions, and extreme weed pressure can result in the lack of bulb formation, which results in the lower yield. Weeds may also serve as reservoir host for disease and insect pests, resulting in enhanced infestation on onions. Therefore, weed control is very critical for securing optimum yield in onion production.

Problematic weeds for onion in the Imperial Valley

Winter and early emerging summer weeds are problematic for onion production in the low desert region. Some of the problematic broadleaf weeds for onion production in Imperial Valley are: nettleleaf goosefoot (*Chenopodium murale* L.), common purslane (*Portulaca oleracea* L.), clover species (*Trifolium* spp.), annual sowthistle (*Sonchus oleraceus* L.), and wild beet (*Beta vulgaris* ssp.). Grass weeds such as annual bluegrass (*Poa annua* L.), Mexican sprangletop (*Leptochloa fusca* L.) and canarygrass (*Phalaris* spp.) are also common problems in Imperial Valley's onion fields. Nutsedge species (*Cyperus* spp.) are commonly found perennial weeds in onion production.

Mustard weeds such as London rocket (*Sisymbrium irio* L.) and shepherd's-purse (*Capsella bursa-pastoris* L.) are also problematic weeds in the low desert onion production. In recent years, swinecress species have become a major weed problem in onion fields throughout the Imperial Valley. There are two species of swinecress, greater swinecress (*Coronopus squamatus* L.) and lesser swinecress (*Coronopus didymus* L.), found in the Imperial Valley. However, the greater swinecress has become a major problem. Onion growers and PCA's have noticed that most of the herbicides labeled for onion have less effect on swinecress. Greater swinecress is believed to have been introduced into the Valley through contaminated onion seeds, eventually spreading throughout the Valley and becoming a major weed in onion production.

Weed management challenges for onion production in Imperial Valley

While early season weed control is very critical, follow-up maintenance weed control during the entire growing season is important for a successful onion production. If onion is kept free of weed interference for about eight to 10 weeks after emergence, later-emerging weeds would cause less problems. Therefore, implementation of a weed management program from the early stage of onion growth is very important.

Even though weeds are the primary pest for onion yield loss, implementing an effective weed management program is often challenging. Non-chemical weed control methods in general are costly, takes longer time for implementation, and are often less effective than chemical control. Weed control by cultivation in onion beds is not feasible because the crop is planted at very high density; usually, four to six seed lines on 22- to 24-inch bed tops on 40-inch beds. Hand-weeding is also not practical because of very high planting density and can result in significant crop stand loss because of a shallow root system. In Imperial Valley, organic growers have been practicing soil solarization technique as a tool for weed control. Soil solarization is effective on many weed species; however, there are certain weeds which are left uncontrolled by this technique. Further research is needed to optimize this technique for controlling some of the problematic weeds, such as little mallow (*Malva parviflora*), common purslane, nutsedge species etc.

Presently, herbicide application is the primary weed control method for onion production in the Imperial Valley. Weed control programs may consist of preemergence; early-postemergence (POST), mid-POST, late-POST; and layby herbicides for maintaining season-long weed control. Despite several applications, it is often challenging to maintain effective control of some tougher weeds from herbicides currently labeled for onion in California. For example, effective control of greater swinecress is often not achieved because most of the herbicides registered for onion in California are less effective on this weed. Therefore, it is very important to evaluate newer herbicides (newer herbicide compound or products registered for onion production in other states) and if they have a good fit in California's low desert onion production system. A future research

project is underway to evaluate newer herbicides under field conditions. Findings will be shared as they become available.

For more information on weed control in onion, please visit the University of California Statewide Integrated Pest Management Program from California Agriculture & Natural Resources at this link: <http://ipm.ucanr.edu/PMG/selectnewpest.onion-and-garlic.html>

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