Nutsedge Control in Field Crops

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Introduction

Nutsedge is commonly described as the world's worst weed. Yellow nutsedge (*Cyperus esculentus*) and purple nutsedge (*Cyperus rotundus*) are troublesome perennial weeds in California. The most common species in most areas is yellow nutsedge, but purple nutsedge, is more common in desert areas and southern San Joaquin Valley. Left uncontrolled, they can significantly reduce stand establishment, yield, and quality in cotton and other field crops. Infestations often begin in poorly drained parts of a field or along irrigation ditches. Tubers are commonly spread by tillage equipment. Cleaning equipment before moving between fields will keep nutsedge from infesting new fields.

Nutsedge can reduce yield substantially if allowed to compete with the crop during the first few weeks after planting, especially if the competition is great enough to cause moisture stress in crop seedlings. To prevent losses, prevent nutsedge from emerging ahead of the crop. To give the crop a head start on nutsedge, use sweeps to dislodge early nutsedge shoots before planting in row crops. In preirrigated fields, the use of sweeps may result in a small loss of soil moisture, but the moisture savings gained from slowing nutsedge growth compensates this loss.

Summer Fallow Programs

Purple nutsedge tubers are susceptible to drying and can be destroyed with repeated summer tillage. Spring-tooth harrows are usually the best tools for this purpose; discing is often ineffective. Work conducted by Paul Keely at Shafter Research Station showed 95 percent control by listing and splitting the beds in summer. The remaining 5 percent still remains a problem the next season. Tillage is not likely to be successful in soils that form large clods or in fields where a high water table keeps soil near the surface moist. Tillage is not as practical for control of yellow nutsedge, because the tubers can survive up to 4 years in dry soil. Reports on the effectiveness of tillage are variable and often contradictory partly because of a general failure to distinguish between the species of nutsedge.

The use of EPTC (Eptam) during a fallow or idle summer season can suppress the growth of both yellow and purple nutsedges. Preirrigate the field in June or July to sprout tubers and allow nutsedge to emerge. Apply EPTC as a broadcast application and incorporate by discing at the same time. For best results, use a finishing disc in two directions with a heavy drag bar to seal the soil surface. Treat the nutsedge shoots that escape the EPTC treatment with spot applications of glyphosate. After application, leave the soil undisturbed for at least 60 days. To prepare the land for planting of a subsequent crop, preirrigate and disc the soil at least once before the beds are formed. Plant back restrictions vary for different crops.

The most effective control is obtained by preventing the production of new tubers. Prevent the nutsedge plants from developing beyond their 4 to 6-leaf stage. Repeat applications of glyphosate at 1.0 to 2.0 lb ai/A or with Halsulfuron (Sempra) gives excellent control applied postemergent to purple or yellow nutsedge. Treating at least twice but often three times a year at monthly intervals is essential to prevent new tuber formation. Halsulfuron is more effective but

has plant back restrictions that will limit its use for most broadleaf crops. Repeated applications of MSMA may also provide some control. Postemergent applications of herbicides will not be effective if nutsedge is water stressed. Delaying the treatment beyond the 6-leaf stage of growth can reduce the effectiveness of earlier treatments because of the production of new tubers.

Deep Plowing

Nutsedges grow mainly from tubers or "nutlets" and can emerge from a depth of 20 inches. Plants are capable of producing up to 300 tubers each. Tubers can remain viable up to 4 years. The primary means of reproduction is through underground vegetative propagules (tubers) formed on rhizomes, mostly in the upper 1-foot (30 cm) of soil. As these tubers mature, they become impervious to most herbicides and require alternative methods for control.

Burying nutsedge tubers can result in high tuber mortality (80% or more) through decomposition, but it is difficult to bury them with most conventional equipment. A modified moldboard plow (Kverneland plow) was designed to invert the upper soil profile to a plowing depth. It has been used with some success to bury weed seeds such as black nightshade as well as disease pathogens (sclerotinia in lettuce).

Kurt Hembree, Tim Prather, and Michelle Lestrange conducted studies to contrast the effectiveness of a moldboard and Kverneland plow at burying yellow and purple nutsedge tubers deep into the soil profile. The Kverneland plow reduced the number of yellow nutsedge tubers to a depth of 8 inches, while purple nutsedge tubers were reduced in numbers to a depth of 10 inches. Since a significant number of yellow nutsedge tubers died after burial at a depth of 12 inches or more, using the Kverneland plow for deep burial can be an effective tool in a yellow nutsedge control program. However, in order to prevent bringing up remaining viable tubers, the field should not be plowed again for at least two years.

Purple nutsedge tubers were also distributed at higher numbers deep in the soil profile than yellow nutsedge, making it more difficult to obtain control since many tubers at the middle depth remain at that depth and can produce plants during the growing season. The five-bottom Kverneland plow used in one study did not invert the soil as effectively as the two-bottom plow. The horsepower requirements of the larger plow may have taxed the 240 HP tractor sufficiently so that the tractor could not pull the plow at a speed necessary for proper soil inversion. A tractor equipped with front-wheel-assist would have benefited the operation of the plow. While there appeared to be no difference in cotton stand establishment between the two plow treatments, purple nutsedge plants emerged at least two weeks earlier in the moldboard than in the Kverneland treated plots.

Metham Herbicide Applications

A preplant application of metham in cotton or vegetable crops can help suppress severe infestations of both purple and yellow nutsedge. Apply metham to preirrigated, preformed beds with an 8-inch (20-cm) spray blade 4 to 6 inches (10 to 15 cm) below the soil surface and then cover the treated soil with a 2- to 3-inch (5- to 7.5-cm) layer cap of soil. The soil must be in seedbed condition, with no clods or trash, and with soil moisture at least 50 percent of field capacity. On a well-drained soil of light to medium texture (sandy loam to loam) that is not

excessively wet or cold following application, planting may take place 14 to 21 days after treatment. If the soil has high clay content, is high in organic matter, or remains wet and cold, allow at least 21 days before planting. To determine if it is safe to plant following a metham treatment, transplant a potted pant, such as a succulent annual, into the field. If the plant is growing within 1 to 2 days of transplanting, it is safe to plant. At planting, avoid mixing untreated soil with treated soil. Control will be lost in the seed row if treated soil is pushed into the furrow or untreated soil is moved into the planted row. Metham can cause yield reductions in some fields due to loss of soil mycorrhizae resulting in reduced phosphorus uptake by the young cotton seedling.

Crop Rotation

In addition to summer fallow, several combinations of rotation crops, herbicides, and tillage can improve long-term management of nutsedge. An established crop effectively competes with nutsedges, which have little tolerance for shade. With effective early season nutsedge control there is sometimes little need for special control measures later as long as a good crop stand exists. Crops such as corn, sorghum, and alfalfa are effective rotation crops because of their ability to shade nutsedge and herbicides in those crops can be used to reduce nutsedge populations.

Nutsedge Control in Cotton

When used alone, the foliar-applied herbicide MSMA can suppress nutsedge in the seed row after cotton has emerged. MSMA is more effective on yellow than purple nutsedge. It is safest to use on cotton in the cotyledon stage, however it is not registered to use until cotton plants have two or more true leaves. Temperatures need to be at least 80 degrees F. to be effective. Make a second application 1 to 3 weeks later using a directed spray aimed at the base of the cotton. All applications must go on before first cotton bloom. MSMA will often cause a purplish discoloration and may retard cotton growth. Injury to cotton can be severe when plants are stressed for water. Don't use MSMA more than twice per season as it may leave a soil residue that can damage some rotation crops.

More growers have shifted to herbicide-resistant cotton to avoid injury associated with MSMA. Approximately 30 percent of cotton acreage in California is planted to Roundup Ready cotton and will likely increase as new varieties are developed. Glyphosate is applied in two applications over the top of glyphosate-tolerant cotton before the fourth leaf stage of cotton. A third application is often required using a hooded sprayer after the 5th leaf stage. Generic glyphosates have shown similar control in a couple University studies. More consistent control is obtained when ammonium sulfate at 5 to 15 lbs/A is mixed with Roundup. In the future we look forward to enhanced Roundup Ready varieties that have more crops safety with a greater application window.

Careful cultivation is essential for early season control even when using herbicides. After cotton has emerged, use precision equipment to cultivate as closely as possible to the crop row. Use sweep type cultivators (Alloways). Rolling cultivators are ineffective for nutsedge suppression and spread nutsedge tubers creating larger areas of infestation.

Nutsedge Control in Alfalfa

Another partially successful rotation in the San Joaquin Valley includes alfalfa treated with EPTC (Eptam).Two applications are needed before July. Eptam is more effective on lighter soils. This rotation has not been as effective at reducing nutsedge in Southern California desert valleys and in Arizona. Zorial (norflurazon) applied postemergent has given short-term (about 4 weeks) suppression of nutsedge. Crop phytotoxicity is a concern and the long soil residue restricts rotations.

Nutsedge Control in Corn

Nutsedge is very competitive with corn in the early stages of growth. Running a sweep four inches below the top of the bed or power tilling the beds with L-shaped knives 3 to 4 inches deep before planting is effective in inhibiting nutsedge that has already sprouted. It is important to cultivate a second time for nutsedge after the crop has emerged. In the second cultivation, throw soil to the corn plants to suppress nutsedge growth and allow corn growth to shade the furrow. Keep at least 4 inches from corn plants to avoid pruning fibrous roots and use sweep type cultivators.

Metolachlor (Dual) and alachlor (Lasso) herbicides can give effective preemergence yellow nutsedge control. EPTC (Sutan, Eradicane) applied preplant incorporated provides good control of both yellow and purple nutsedge in corn. Use the higher labeled rates for the most effective control. To maximize the performance of preplant incorporated herbicides, the following is important: 1. Preirrigate where feasible. 2. Disc in manures before incorporating the herbicide. 3. Incorporate to the proper depth: 4 to 6 inches for EPTC and 2 to 3 inches for alachlor or metolachlor. 4. When using a rotary hoe, incorporate two times, in opposite directions. 5. Broadcast applications of EPTC require cross discing for maximum incorporation and effective weed control. 6. Time incorporation according to the manufacturer's label: EPTC immediately; alachlor and metolachlor, 7-14 hours. 7. Use proper incorporation speed. 8. Disturb nutsedge by using sweeps or power mulchers before planting. 9. Plant immediately after herbicide application.

Halsulfuron (Sempra) gives excellent control applied postemergent to purple or yellow nutsedge. Two applications are preferable. Make the applications when nutsedge is less than 5 leaves. Do not cultivate within 7 days following application. Halsulfuron can be applied over the top of corn or with drop nozzles from the spike stage through layby. Glyphosate applied to Roundup Ready corn varieties will provide good control. Two applications are most effective. Tank mix combinations of Sempra and glyphosate should enhance control in Roundup Ready corn.

Conclusion

Because nutsedge is nearly impossible to eradicate and will quickly reinvade the field if control measures are relaxed, a vigorous control program must be maintained indefinitely. Persistence in pursuing proper control measures including all possible cultural and chemical control methods, results in considerably reducing nutsedge populations.

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