Yellow Nutsedge Biology and Control in Potato Rotations

Rick Boydston, USDA-ARS, Prosser, WA

Yellow nutsedge (*Cyperus esculentus* L.) is considered a native perennial weed common in irrigated row crop production throughout most of the U.S. (Mulligan and Junkins 1976). However, it was imported as a potential crop in 1854 which was likely an additional source of weedy tubers (Defelice 2002). Nutsedge is susceptible to shading, and crops that quickly form a dense canopy often out-compete the weed. Yellow nutsedge is particularly problematic in crops that do not provide adequate shading, such as onions (Figure1).

Figure 1. Nutsedge in onions; onions are not visible.

The weed competes strongly for water, nutrients, and light and management practices including frequent irrigation and high nitrogen fertilization stimulate yellow nutsedge growth (Keeling et al. 1990; Mulligan and Junkins 1976; Torrell et al. 1993). Yellow nutsedge grows best in wet areas, which are often the initial source of infestations (Bendixin and Nandihalli 1987).

Esculentus, means edible in latin (Negbi 1992). There are two varieties of *esculentus*: *Cyperus esculentus* var. *esculentus* (weedy) and *Cyperus esculentus* var. *sativus* (cultivated). The cultivated type, also known as chufa, has larger and less winter hardy tubers, and is less aggressive than the weedy type. Chufa has an almond-like flavor

and is grown as a food crop in southwestern Europe, Africa, and parts of Asia. Processed nutlets are used in a variety of foods, beverages, and soaps (Cantalejo 1997).

Yellow nutsedge is a member of the Cyperaceae (sedge) family with leaves that are narrow and grass-like, growing in three vertical rows on the stem (Figure 2). It is often incorrectly identified as a grass.

Figure 2. Young nutsedge plants.

Yellow nutsedge has upright, triangular, yellow-green stems that grow 1 to 3 feet tall with most of the leaves clustered at the base of the stem. The small flowers are yellowish or yellowish-brown, and arranged in narrow spikelets on umbel-like inflorescences (groups of flowers originating from a single point). Located immediately below the inflorescence are three to nine inch long leaf-like structures (bracts). Seed is viable, but not considered the major means of reproduction.

Yellow nutsedge reproduces and is dispersed primarily by tubers (nutlets) that are formed at the apical ends of underground rhizomes. Tubers are produced in the upper 18 inches of the soil with the greatest concentration located in the upper 6 inches (Stoller and Sweet 1987, Tumbleson and Kommedahl 1961). After a period of dormancy, tubers germinate and produce shoots in subsequent growing seasons. Yellow nutsedge tuber production can be prolific and a single tuber can produce about 1900 plants and over 7000 tubers in a growing season (Reddy et al. 1988). High nitrogen promotes vegetative growth over reproductive growth, leading to increased basal bulb formation (and subsequent shoot production) as opposed to tuber formation (Garg et al. 1967).

Tubers produce one to three sprouts, which grow toward the soil surface and form a primary basal bulb just below the surface. Each primary basal bulb produces a vegetative plant. The ability of tubers to produce several sprouts often results in erratic or temporary control when using cultivation or herbicides, with new sprouts emerging after

control tactics are employed. Cold winter temperatures kill basal bulbs, rhizomes, fibrous roots, and all aboveground parts. While tubers may be viable up to 3 years, most only survive one winter (Mulligan and Junkins 1976).

As with most weeds, no single measure is adequate for controlling yellow nutsedge. However, an integrated program combining preventative, cultural, mechanical, and chemical methods can be effective in managing yellow nutsedge. Yellow nutsedge should be prevented from spreading into new areas. Field equipment contaminated with nutsedge tubers and rhizomes should be cleaned prior to moving to new fields. Vegetatively propagated crops such as mint, asparagus, and flower bulbs that are contaminated with yellow nutsedge should not be utilized for propagation. Rotation to competitive crops with many cultivation and effective herbicide options, such as field corn, is also an important yellow nutsedge management tactic.

Potatoes compete fairly well with yellow nutsedge, especially when planted early and when conditions favor potato growth and early canopy closure. Planting certified potato seed that has been properly stored and handled and avoiding planter skips will help provide a competitive potato canopy. Crops that develop thick canopies can out-compete yellow nutsedge before it has a chance to get established. Yellow nutsedge grows rapidly in warmer soils and shoot emergence is often delayed relative to many spring germinating weeds. In some areas, yellow nutsedge tubers have been known to grow into potato tubers causing them to be graded as culls.

Soil fumigation with metham sodium can reduce yellow nutsedge tuber viability but control is variable (Ransom 2004). Fumigant efficacy depends on the dose reaching the nutsedge tubers and the physiological stage of the tubers when fumigated. I_{50} doses for metham sodium ranged from 22 to >80 gallons/acre of Vapam in studies by Ransom (2004). Glyphosate applied at 1 to 3 lbs ai/a controls top growth of yellow nutsedge, but new sprouts usually emerge later.

Herbicides that suppress or control yellow nutsedge in potatoes include EPTC (Eptam) applied PPI, metolachlor or s-metolachlor (Dual) and dimethenamid-p (Outlook) applied PRE, and rimsulfuron (Matrix) or metribuzin (Sencor) applied PRE or POST. A new nonregistered herbicide from Valent was tested in Shepody potatoes in 2007 by Dr. Boydston with USDA-ARS in potato trials north of Pasco, WA and by Dr. Joel Felix with Oregon State University in Ontario, OR. Both preemergence and sequential applications (preemergence followed by postemergence) of this herbicide suppressed yellow nutsedge well without injury to potatoes at both locations. Sequential applications controlled the weed more consistently at both locations. Research will continue over the next several years to register this herbicide in potato.

Additional studies were conducted in container trials in 2007 to determine the effect of several preemergence and postemergence applied herbicides on yellow nutsedge control and tuber production. Yellow nutsedge tubers were planted in containers filled with silt loam soil and herbicides were applied. Six weeks after planting, yellow nutsedge plants were harvested and the number of viable tubers determined. Treatments of s-metolachlor (Dual) and dimethenamid-p (Outlook) applied preemergence reduced the number of viable tubers to less than 6 per container compared to 34 to 88 tubers produced by nontreated control plants. Growth of yellow nutsedge shoots was reduced by 90% or more by both herbicides over the 6 week period. S-metolachlor and dimethenamid-p applied to emerged yellow nutsedge in the 2-leaf stage was less effective than

preemergence applications, but still reduced the number of viable tubers produced by 72 to 93% compared to nontreated plants.

References

Bendixen, L.E. and U.B. Nandihalli. 1987. Worldwide distribution of purple and yellow nutsedge (*Cyperus rotundus* and *C. esculentus*). Weed Technology 1: 61-65.

Cantalejo, M. J. 1997. Analysis of volatile components derived from raw and roasted earth- almond (*Cyperus esculentus* L.). J. Agric. Food Chem. 45: 1853-1860.

Defelice, M. Intriguing World of Weeds: Yellow nutsedge *Cyperus esculentus* L. – Snack food of the Gods. Weed Techology 16:901-907.

Garg, D. K., L. E. Bendixen, and S. R. Anderson. 1967. Rhizome differentiation in yellow nutsedge. Weed Science 15:124-128.

Keeling, J. W., D. A. Bender, and J. R. Abernathy. 1990. Yellow nutsedge *(Cyperus esculentus*) management in transplanted onions *(Allium cepa).* Weed Technol. 4:68-70.

Negbi, M. 1992. A sweetmeat plant, a perfume plant and their weedy relatives: A chapter in the history of *Cyperus esculentus* L. and *C. rotundus* L. Econ. Bot. 46:64-71.

Mulligan, G.A. and B.E. Junkins. 1976. The biology of Canadian weeds. 17. *Cyperus esculentus* L. Canadian Journal of Plant Science 56:339-350.

Ransom, C. V., C. A. Rice, and J. K. Ishida. 2004. Factors influencing Vapam efficacy on yellow nutsedge tubers. Annual Report, Oregon State University, Malhuer, OR.

Reddy, Krishna N. and L. E. Bendixen. 1988. Toxicity, adsorption, translocation, and metabolism of foliar-applied chlorimuron in yellow and purple nutsedge (*Cyperus esculentus* and *C. rotundus*). Weed Science 39:707-712.

Stoller, E.W. and R.D. Sweet. 1987. Biology and life cycle of purple and yellow nutsedges (C*yperus rotundus* and *C. esculentus*). Weed Technology 1:66-73.

Tumbleson, M. E. and T. Kommedahl. 1961. Reproductive potential of *Cyperus esculentus* by tubers. Weeds 9:646-653.