SUPPRESSION OF NUTSEDGE WITH PLASTIC MULCH

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In Florida vegetable crops, the purple and yellow nutsedges (*Cyperus rotundus* and *C. esculentus*) rank among the ten most common and troublesome weeds. Successful herbicidal or cultural control of competing weeds has provided open niches for nutsedges and increased their impact in many cropping systems. Both species are major weeds in plastic mulch vegetable production systems, because their sharp growing tips readily penetrate most commonly used plastic mulch films.

Vegetative growth patterns are similar in the two species. Both produce rhizomes, tubers, and basal bulbs. Nutsedge seedlings develop basal bulbs which give rise to rhizomes. Rhizomes terminate in a tuber or in a shoot with a new basal bulb. Germinating tubers also produce rhizomes.

Management of nutsedge has focused on control of emerged plants and reduction of tuber populations in field soils. Mechanical cultivation, herbicides, and hand-hoeing are used alone or in combination. No single management system short of soil sterilization is likely to eliminate either nutsedge species. The large tubers contain sufficient food reserves to maintain viability for at least 2 years, and the numerous buds on each tuber may sprout at different times, further complicating control efforts. Most herbicides registered for use in vegetables are ineffective against the nutsedges because of the resistance of the tubers to chemical control. Detached, dormant tubers are very difficult to kill, even with soil fumigants.

In field trials in New Jersey, Majek and Neary discoverd that yellow nutsedge failed to emerge through an infrared transmitting plastic mulch film. This photoselective film was designed to produce soil heating by transmitting infrared radiation while at the same time blocking most photosynthetically active radiation, thereby inhibiting weed growth.

After consultation with several authorities on plastic mulch, experiments were conducted in the greenhouse and field to investigate the effects of several plastic mulches on the emergence, growth, and vegetative reproduction of purple nutsedge under subtropical Florida conditions. Three mulch films were used: standard opaque white-on-black (W/B) mulch which transmits no visible or infrared radiation; silver mulch which transmits approximately 1.4 % of incident radiation with no wavelength selectivity in the range of 375 to 975 nm; and infrared transmitting (IRT) mulch which transmits 5 to 10 % in the 375 to 725 nm range and 12 to 33 % from 750 to 975 nm.

The greenhouse experiment was conducted in 16 cm diam. plastic pots filled to the top with potting soil. Three nutsedge tubers were planted in each pot, and the pots were covered with one of the three mulch films, held tightly in place with monofilament line. A fourth set of pots was left uncovered (bare soil). The pots were maintained in shallow trays and subirrigated with dilute fertilizer solution as needed. Emerged shoots were counted at 11, 25, 49, and 68 days after planting (DAP). The plants were harvested at 68 DAP for determination of numbers and dry weights of shoots, tubers, basal bulbs, and rhizomes.

The phenomenal capacity of purple nutsedge for growth and reproductive development was evident in the bare soil pots. The initial infestation of 3 tubers/pot (150/m^2) produced

29 shoots (1450/m^2), 49 basal bulbs and tubers (2450/m^2), and 26 rhizome growing tips (1300/m^2) after 68 days. The W/B mulch had 525 emerged shoots/m^2, 1450 basal bulbs and tubers/m^2, and 550 rhizome tips/m^2. The silver and IRT mulches had no rhizome tips or emerged shoots and only 125 and 40 tubers/basal bulbs/m^2, respectively. Shoot dry weights were 610, 320, 13, and 1 g/m^2 in the bare soil, W/B, silver, and IRT treatments, respectively. Corresponding tuber weights were 186, 84, 1.5, and 0.5 g/m^2.

The field experiment was conducted at the Indian River Research and Education Center at Ft. Pierce, FL on an Oldsmar sand. A naturally infested area of nutsedge was tilled and bedded to make a raised bed 110 cm wide and 20 cm high. Plastic was applied to the bed on 3/19/96, and emerged nutsedge shoots were counted after 6, 10, 13, 23, and 112 days. At 112 days the plots were harvested for determination of numbers and weights of shoots and of underground parts consisting of rhizomes, tubers, and basal bulbs.

The W/B, silver, and IRT mulches had 551, 25, and 35 emerged shoots/m^2 , respectively, after 112 days. The W/B mulch treatment had 196 rhizome tips, 1409 old tubers, and 92 new tubers /m^2. The silver mulch had 13 rhizome tips, 687 old tubers, and 4 new tubers /m^2. The IRT mulch treatment had 12 rhizome tips, 766 old tubers, and 3 new tubers /m^2 after 112 days.

Both IRT and silver mulches offer potential for limiting the growth and reproductive development of purple nutsedge under Florida conditions. These mulches raise soil temperature more than conventional white-on-black mulches which may be a disadvantage or an advantage, depending upon crop species and time of year.

The mechanism for nutsedge suppression by these mulches is unknown. Diurnal observations indicate that nutsedge shoots can emerge through all three mulches during both light and dark periods. Therefore, some phenomenon other than the exclusion of light by the W/B mulch must account for its penetration by nutsedge shoots. It is notable that at the bed edges, where the plastic film is most firmly appressed to the soil, all the mulches are readily penetrated. It is possible that the limited photoautotrophic growth supported under both the IRT and silver mulches lifts the mulch above the soil surface sufficiently to reduce penetration by nutsedge shoot tips. Further studies of the dynamics of mulch penetration by nutsedge may reveal the mechanism of suppression by some mulches.