

Tomato Weed Control: Historical Overview (1970-Present) and Current Research

*Robert J. Mullen, Farm Advisor, University of California Cooperative Extension,
San Joaquin County*

Introduction

In 2002, California produced 93 percent of the processing tomatoes in the United States with a farm gate value of nearly \$550 million; average per acre yields were nearly 38 tons. In 1970, the California industry was the dominant U.S. producer but the farm gate value was only \$84.8 million and yields only averaged 23.8 tons per acre. The dramatic increase in production per acre and crop value can be attributed to a number of factors: varietal improvement, better cultural practices and certainly the development of Integrated Pest Management, with weed control a major component of this success.

As with most crops, tomatoes have been plagued with a number of weed problems that affect production including black nightshade (*Solanum nigrum*), hairy nightshade (*Solanum sarrachoides*), yellow nutsedge (*Cyperus esculentus*), dodder (*Cuscuta sp.*), field bindweed (*Convolvulus arvensis*), barnyardgrass (*Echinochloa crus-galli*) and other annual and perennial weed species. This paper will attempt to provide an historical overview of tomato weed control efforts since 1970, highlighting the major herbicides evaluated, the techniques employed and the changes that have occurred in the number of chemical companies and public sector researchers involved. The paper will be summarized with a brief presentation of current research and a look at some of the challenges to successful weed management that remain.

Tomato Weed Control (1970-1980)

Most of the tomato weed control effort concentrated on evaluation of preemergence herbicides, including Devrinol (napropamide), which attained a registration on tomatoes in the early 1970's. Deep shank injection of 1,3D into tall beds well in advance of crop planting was employed as well as the development of plug planting, using a dry mixture of peat moss, vermiculite, carbon and (tomato) seed put into beds that had marginally selective herbicides like Dual (metolachlor), Furloe (CIPC), Sonalan (ethafluralin), etc., shallow incorporated into the beds before planting. Growers began to go to fall bedding in an effort to plant earlier in the spring and this necessitated the fallow bed evaluation of Gramoxone (paraquat), Enide (diphenamed), Roundup (glyphosate) and Sencor (metribuzin). Also work started on postemergence use, over the tomato crop and emerged weeds, of Sencor and Basagran (bentazone).

During this decade, 18 preemergence and 3 postemergence herbicides were evaluated on tomatoes. Representatives of 14 chemical companies and 16 University of California academic personnel were involved in this research.

Tomato Weed Control (1981-1990)

During this period, preemergence efforts concentrated on the development of application methods of preplant application of Vapam (metham), including the use of a subsurface blade with soil cap sealing, high water volume soil drenches and mechanical incorporation. Perlka (calcium cyanamide) was also evaluated preplant either as mechanically or rainfall incorporated treatments. Postemergence treatments, over the tomato crop and emerged weeds (primarily hairy and black nightshade, involved evaluation of Sencor and Tackle (acifluorfen) and Basagran for yellow nutsedge management. Also postemergence evaluation of Poast (sethoxydin), Fusilade (flusifop) and Select (clethodim) was done for grass control during the tomato cropping season. Fallow bed herbicide evaluation continued with standard materials and the addition of Goal (oxyfluorfen) and Ignite (glufosinate).

Sixteen preemergence and 10 postemergence herbicides were evaluated during the period with representatives of 17 chemical companies and eleven University of California academic personnel involved in tomato weed management research.

Tomato Weed Control (1991-2000)

Preemergence weed control efforts during these years continued the evaluation of Vapam and Perlka for preplant weed control as well as preplant incorporated and layby evaluation of Dual Magnum (metolachlor), Frontier (dimethonamid) and Prowl (pendimethalin). With the advent of the sulfonylurea family of herbicides, an intense research effort was conducted on the preemergence/postemergence examination of Shadeout/Matrix (rimsulfuron) for management of black and hairy nightshade, dodder and other annual broadleaved and grass weed species. The work was successful in obtaining a registration for Shadeout/Matrix in 1997, the first preemergence/postemergence herbicide registration on tomatoes in nearly 25 years. Sencor was also evaluated as single or sequential low rate postemergence applications during the early growth stage for the tomato crop. In the late 1990's, concentrated preemergence and postemergence evaluation of Permit/Sandea (halosulfuron) occurred with an abundance of work done on postemergence management of yellow nutsedge during the tomato cropping season.

Twelve preemergence and 9 postemergence materials were tested on tomatoes during the 1990's and representatives of 12 chemical companies and nine University of California academic personnel cooperated on tomato weed control research.

Tomato Weed Control – Current Research

For the past two years, weed control research in tomatoes has concentrated on preemergence evaluation of Prowl, Dual Magnum, Shadeout/Matrix, Sandea, Devrinol and Authority (sulfentrazone) alone or as combination treatments to maximize weed control efficacy and manage any potential problem of weed resistance with Shadeout/Matrix by using other preemergence herbicides having different modes of action. Postemergence research efforts have focused on Shadeout/Matrix and Sandea alone or in combination treatments, particularly in situations where nightshade and yellow nutsedge occur in the same field. Sencor is also included for control of both nightshade and other annual broadleaved weeds, as well as for weed resistance management where sulfonylurea herbicides may be used. Only 7 preemergence and 4 postemergence herbicides are currently being examined with representatives of only 7 chemical companies and 5 University of California academic personnel taking part in the tomato weed

control research effort. Consolidation of companies into a few large entities, combined with the retirement of many University of California weed scientists has led to the current situation.

There are still many challenges to a truly successful tomato weed management program:

- 1 The development of only a limited number of herbicides for vegetable crop use
- 2 The need for vigilance in weed resistance management
- 3 The fact that problem weeds like dodder, field bindweed and velvetleaf (*Abutilon theophrasti*) are still not adequately controlled on tomatoes.
- 4 The current program of nightshade and yellow nutsedge management must be better defined to maximize weed control and reduce cost.