

YELLOW FOXTAIL IDENTIFYING THE PROBLEM

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Alfalfa, an important California crop was harvested from 1.26 million acres in 1982, providing a market value of 635 million dollars and ranking sixth as an income crop among all state farm commodities. The crop is grown from the low desert valleys in southern California where nine to ten cuttings per season are common to mountain valleys in northern California where two to three cuttings are the usual. The major alfalfa production regions in the state are the Sacramento and San Joaquin valleys producing 60%, followed by the low desert of southern California producing 20%.

In California about 75% of the alfalfa hay is utilized by the dairy industry. Quality is an important consideration to the dairyman when buying hay. A major influence on quality is the presence of weeds. Yellow foxtail (*Setaria lutescens* Weigel Hubb) has received increased attention in the last several years due to its rapid spread and undesirable effect on alfalfa hay quality.

A review of the literature showed that only since 1975 have specific articles been presented regarding yellow foxtail in California alfalfa (2). Further, it was difficult to document when yellow foxtail became an economic pest in alfalfa, where in the state it is located, and to what extent it is a problem in California alfalfa hay. Therefore, a questionnaire on yellow foxtail was distributed to the U.C. Cooperative Extension county farm advisors*. The results of the survey collected from 30 counties and representing 893,500 acres of the state's planted alfalfa were compiled in an effort to determine (a) the extent of the problem, (b) the understanding of yellow foxtail as a weed, and (3) to provide a reference base for future investigations.

Schoner (4) reported that yellow foxtail, a summer annual grass weed, is distributed throughout the temperate climate regions of the world and that in 1838 yellow foxtail was first reported in California. He states that yellow foxtail is generally not considered an important pest in row and field crops, but that during the past 25 years has become an increasingly serious weed in the state's alfalfa hay-growing areas. Information gathered from the survey in response to the question, "when did yellow foxtail become a serious problem in the county?", would substantiate this time period (Table 2).

Table 2 Question: When did yellow foxtail become a serious problem in the county?

<u>Statement</u>	<u>%^{1/}</u>
During past 10 years	36.7
10-20 years ago	13.3
Always a serious problem	13.3
Not present or not serious problem	30.0
<u>Do not know</u>	<u>6.7</u>

1/ Percentage based on 30 survey responses

Survey results regarding the distribution and severity of yellow foxtail as a pest in California alfalfa hay are shown in Figure 1. These results demonstrate that yellow foxtail has become the number one summer annual weed in nine of the Sacramento and San Joaquin valley counties and is found in 25 out of the 30 counties surveyed.

Why has yellow foxtail become a serious weedy pest in less than 25 years? Schoner (4) offers several possible reasons, starting with the widespread use of mechanized equipment which significantly changed cultural practices in alfalfa hay production since WW II. These implements brought about major changes in harvest techniques which has contributed to alfalfa stand decline and has increased the potential for moving yellow

*Completed survey responses on file at U.C. Cooperative Extension offices in Madera San Joaquin and Sacramento counties.

foxtail seed intra- and inter-field rapidly. Another factor which has contributed to the establishment of this weed in alfalfa is the biological characteristics of the plant. Norris and Schoner (1, 4) have shown that the yellow foxtail in California alfalfa is a different biotype which has readily adapted to its new environment created by the modern alfalfa production practices. Their studies revealed that the yellow foxtail biotype was prostrate in growth habit, enabling it to survive the frequent and low cutter-bar harvesting of alfalfa. Also, their studies and that of Stoller (6) showed this biotype could achieve 50% germination within a few days once soil temperatures reach 60°F. They also observed that under alfalfa field conditions in Yolo County, yellow foxtail emerged as early as March.

Field observations taken during the past four years confirm Norris and Schoner's research (Table 3 and Figure 2).

Table 3 Date of initial yellow foxtail emergence

<u>City/County</u>	<u>Date</u>
Raisin City - Fresno	Feb. 25, 1981
Raisin City - Fresno	Feb. 24, 1982
Red Top - Madera	Feb. 22, 1983
Farmington - San Joaquin	Feb. 28, 1983
Walnut Grove - Sacramento	Feb. 27, 1983
Los Banos - Merced	Feb. 28, 1984
Durham - Butte	Feb. 16, 1984

These observations demonstrate the potential for late-winter yellow foxtail emergence and rapid germination at soil temperatures of 60 to 70°F.

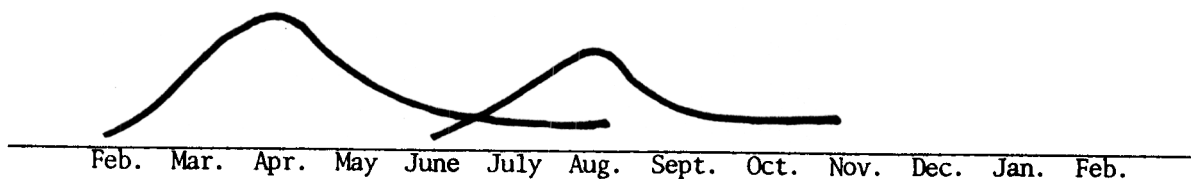
Other results from the Norris and Schoner (3, 5) yellow foxtail biotype studies showed that the California biotype seed has a short dormant period requirement (about 4 months) and the plant is an abundant seed-producer with a very high seed viability. Also, under field conditions this biotype can out-compete other summer annual weeds; i.e., barnyardgrass (Echinochloa crus-galli).

Another major factor which makes yellow foxtail an undesirable weed in alfalfa is its effect on hay quality. As reported by various researchers (1, 2, 4) and confirmed by the recent U.C. Cooperative Extension survey, the primary concern with yellow foxtail in alfalfa hay is the reduction in TDN and poor hay palatability. Cattle may not eat yellow foxtail-infested hay due to the bristly awns associated with the seedhead. Thus, yellow foxtail has become a major economic weed in alfalfa hay as a result of present production practices, its biological characteristics, and its ultimate effect on hay quality.

Because of yellow foxtail's rapid spread in alfalfa, greater attention has been directed toward its control. A good control program should include a description of the weed's life cycle. The life cycle of yellow foxtail, as presently understood for the Sacramento and San Joaquin valleys' alfalfa hay fields, is shown in Figure 3.

Figure 3. Yellow foxtail life cycle for Sacramento and San Joaquin valleys' alfalfa hay fields.

<u>Establishment</u>	<u>Period Reproductive</u>	<u>Dormant</u>
Require minimum 55 to 60°F for germination	Short-day plant	No chilling requirement



*Maximum germination
mid-March to mid-April

*Produce seed from
July to first frost

*May only require
4 months

*Can germinate before
first cutting

*Maximum August

Subsequent to yellow foxtail germination, an accurate identification of the seedling is required to determine when it becomes a problem in the stand-life of alfalfa. In response to the survey question, "can the grower identify yellow foxtail in the seedling stage as compared to other weedy grasses?", 100% of the respondents stated, "no, they can not". Also, 30.8% of the farm advisors indicated they did not know or were not sure when yellow foxtail emerges in the county. In response to a third question, "in what production year does yellow foxtail appear as a problem in alfalfa hay fields?", 11.4% indicated "in the establishment year" and 27.3% stated "in the second year". These results demonstrate the need for growers, pest control advisors (PCAs), and farm advisors to become more knowledgeable about yellow foxtail. They should plan for this weed prior to planting alfalfa, particularly in the Sacramento and the San Joaquin valley counties.

Results of the survey regarding some currently used yellow foxtail control measures are shown in Table 6.

Table 6: Percentage of alfalfa growers using various yellow foxtail control measures:

<u>Method</u>	<u>%</u>
Cultural	
1. Delayed irrigation between cuttings	
Crop rotation	68.8
Chemical	
No program	43.0

Based on 16 responses from Sacramento and San Joaquin valley counties.

Growers using certain cultural and/or chemical control methods for yellow foxtail reported that they received only poor (65%) to fair (65 to 80%) control. These results may indicate why a high percentage of the growers have no control program and consider crop rotation their only alternative.

In conclusion, research accomplished during the past 10 years has shown why yellow foxtail has become one of the major summer annual weeds in alfalfa hay production. The U.C. Cooperative Extension farm advisors' survey indicates a need for grower, PCA, and farm advisor education programs to increase the general level of knowledge regarding yellow foxtail and has provided a reference base for future investigations.

Literature Cited

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Figure 2. Number of emerged yellow foxtail plants in a Madera and a San Joaquin County alfalfa field.

