WEED PROBLEM CHANGES AFFECTING CENTRAL FLORIDA VEGETABLE PRODUCTION

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ABSTRACT

Observations over a 15 year period in the Sanford and Zellwood vegetable producing areas have revealed several marked changes in the predominant problem weed species. Many weeds of serious concern in 1956 no longer present an economic problem, while others which were relatively unimportant or unknown at that time are serious pests today.

Among the weeds unrecognized as crop pests in 1956, but serious now, are burning nettle, wild celery, broadleaf signalgrass, and Texas panicum. Other new problem species, known earlier but not considered serious, include common lambsquarters and common ragweed on the sand soils and curly dock and smooth pigweed on the Zellwood mucky-peat soils. In contrast, species such as giant amaranth and spiny amaranth have become relatively unimportant in recent years.

These population changes are due to many ecological factors. Most of the changes may be attributable to the introduction of new species into these areas or to the usage of selective chemical herbicides.

INTRODUCTION

During the 15 years from 1956 to 1970, there have been several changes in the weed problems confronting Central Florida vegetable growers. Some weed species have declined in importance, while others which did not occur as serious crop pests before 1956 have become important economic problems. Several of these weeds were unknown in the area before 1956, while others, though present, were not nearly as serious as they are today.

The changes reported here were observed in commercial and experimental row-crop fields in the Sanford and Zellwood vegetable production areas. Common names used in this paper are those accepted by the Terminology Subcommittee on Standardization of Common and Botanical Weed Names of the Weed Science Society of America, as published in the October 1966 issue of Weeds. In a few cases, where the species were not included in the WSSA list, locally prominent names are used. In most cases, the botanical names have been verified by Dr. Daniel B. Ward of the University of Florida Herbarium.

CHANGES OBSERVED IN WEED POPULATIONS

In the Sanford area, with predominantly Leon fine sand soil, the most important population changes have involved the introduction of new species. Most of these species were already present elsewhere in Florida, but did not occur as problem weeds in the Sanford area until recently.

New Weeds of Economic Importance in the Sanford Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Botanical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narrowleaf signalgrass</td>
<td>Brachiaria piligera</td>
</tr>
<tr>
<td>Broadleaf signalgrass</td>
<td>Brachiaria platyphylla</td>
</tr>
<tr>
<td>Texas panicum</td>
<td>Panicum texanum</td>
</tr>
<tr>
<td>Burning nettle</td>
<td>Urtica urens</td>
</tr>
<tr>
<td>Horse purslane</td>
<td>Trianthema portulacastrum</td>
</tr>
<tr>
<td>Phyllanthus</td>
<td>Phyllanthus urinaria</td>
</tr>
<tr>
<td>Eclipta</td>
<td>Eclipta alba</td>
</tr>
<tr>
<td>Umbrella dodder</td>
<td>Cuscuta umbellata</td>
</tr>
<tr>
<td>Asiatic hawksbeard</td>
<td>Youngia japonica</td>
</tr>
<tr>
<td>Bagpod sesbania</td>
<td>Sesbania vescaria</td>
</tr>
</tbody>
</table>

Of the above introduced species, narrowleaf signalgrass and horse purslane were first noted about 1950. They were identified by Professor Erdman West of the University of Florida Herbarium. The others have all appeared as problem weeds since 1956.

Five species, indigenous or long-time residents of the Sanford area, have become increasingly more important during recent years. Conversely, the populations of two species have declined. These are listed below.

Old Weeds Increasing in Prominence in the Sanford Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Botanical Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purple nutsedge</td>
<td>Cyperus rotundus</td>
</tr>
</tbody>
</table>
Yellow nutsedge  
Common ragweed  
Common lambsquarters  
Cutleaf eveningprimrose

Old Weeds Declining in the Sanford Area

Common Name  | Botanical Name
--- | ---
Spiny amaranth  | Amaranthus spinosus
Florida pusley  | Richardia scabra

On the Everglades mucky-peat soil in the Zellwood area of Orange and Lake Counties, eight newly introduced species have become serious problems since 1956. Most serious of these are burning nettle and wild celery, both of which have appeared and spread very rapidly during the last six years.

New Weeds of Economic Importance in the Zellwood Area

Common Name  | Botanical Name
--- | ---
Burning nettle  | Urtica urens
Wild celery  | Apium leptophyllum
Narrowleaf signalgrass  | Brachiaria piligera
Broadleaf panicum  | Panicum adspersum
Umbrella dodder  | Cuscuta umbellata
Horse purslane  | Trianthema portulacaestrum
Eclipta alba  | Eclipta alba
Cressleaf groundsel  | Senecio glabellus (butterweed)

Increasing in importance at Zellwood are several weed species which were known to occur in the peat soils before 1956, but which were of negligible concern to the vegetable growers before that time. All of these were common on the Sanford mineral soils, but they were not serious pests on the organic soils during the early years of this study.

Old Weeds Increasing in Importance in the Zellwood Area

Common Name  | Botanical Name
--- | ---
Purple nutsedge  | Cyperus rotundus
Yellow nutsedge  | Cyperus esculentus
Curly dock  | Rumex crispus
Annual smooth groundcherry  | Physalis angulata
Black nightshade  | Solanum nigrum
Smooth pigweed  | Amaranthus hybridus
Pennsylvania bittercress  | Cardamine pensylvanica
Tansymustard  | Descurainia pinnata

Although smooth pigweed populations have increased during recent years, this has occurred to the almost total exclusion of two other Amaranthus species which formerly were very prevalent on these organic soils. These are giant amaranth and spiny amaranth. The three other weeds in the following list have persisted, but are of much lesser importance today than they were in 1956.

Old Weeds Declining in the Zellwood Area

Common Name  | Botanical Name
--- | ---
Giant amaranth  | Amaranthus australis
Spiny amaranth  | Amaranthus spinosus
Goosegrass  | Eleusine indica
Wandering cudweed  | Gnaphalium pensylvanicum
Narrowleaf cudweed  | Gnaphalium falcatum

Factors Affecting Weed Species Populations

Weed population changes, such as those indicated here, reflect alteration of the natural balance of the plant species native to the area. Some of the ecological factors causing these changes are listed below:

1. Introduction of new species
2. Competition between species
3. Use of chemical herbicides
4. Crop culture methods
5. Genetic adaptation of species

Each of these factors will be discussed briefly to show how they have functioned to bring about some of the changes mentioned in this paper.

Introduction of New Species.—The effect of new introductions on the population balance of species in an area is self-evident. In many of the cases noted here, the new weed was well adapted to the Central Florida environment and soon established itself as a successful competitor with both crop plants and other weeds. Most of these new species came from other areas of Florida. For example, the Phyllanthus and Eclipta species have long been common in South Florida. Wild celery is abundant in native hammock and other wet land areas, but it has become a problem in the Zellwood vegetable area only recently. Likewise, narrowleaf signalgrass, a native of Australia, and horse purslane, from
the Carribbean region, have been in Sanford fields approximately 20 years. They appeared in the Zellwood vegetable area ten years ago, presumably transported along with vegetable transplants. The movement of farm equipment and field boxes also has helped the spread of weed species from one vegetable producing area to another.

There are several known cases where new weeds have been introduced from other areas as contaminants of seeds. In both the Sanford and Zellwood areas, umbrella dodder, now a serious pest, appeared first in carrot plantings. Several species which have appeared by this means have been unsuccessful in becoming established. Among these are coffee senna (Cassia occidentalis) found in soybeans, and dwarf mallow (Malva rotundifolia) and spurred anoda (Anoda cristata) found in spinach at Zellwood. Burning nettle, one of the most vigorous and objectional weed pests in both areas, is believed to have been introduced in hay imported from other states for livestock feed to supplement the poor pastures following the severe 1957 Florida freeze. It quickly spread throughout many pastures and cultivated fields at both Sanford and Zellwood. Its natural tolerance to low temperatures leaves it with very little competition following winter frosts.

**Competition Between Species.**—The decline of a species once prevalent in cultivated areas often can be explained only by its inability to adequately compete with the more vigorous introductions. When two weeds have the same requirements for seed germination and growth, the more vigorous species will dominate, competing successfully with the other for moisture, nutrients, and sunlight. It then produces greater growth and more seed for the next generation. Among the species declining due to competition from other weed species are spiny amaranth, goosegrass, and the cudweeds.

**Use of Chemical Herbicides.**—The widespread use of chemical herbicides during recent years is responsible for several changes in our weed populations. As the more susceptible species are eliminated, the more tolerant ones survive and dominate. Black nightshade, which is highly chemical-resistant, has created a well-known problem in South Florida, particularly where Solonaceous crop herbicides are used. Likewise, in Central Florida, both black nightshade and annual smooth ground cherry populations have increased because of their tolerance to herbicides. The problem with both species of nutsedge has also been aggravated during recent years due to the use of selective chemical weed killers. The nutsedges, notably poor competitors, have often developed large populations in fields where good selective herbicides have prevented the growth of most broadleaf weeds and grasses. Two other examples of serious problems resulting from the expansion of populations of chemical-resistant species involve common ragweed, which is tolerant to most cabbage and carrot herbicides used in the Sanford area, and wild celery, which is tolerant to all of the herbicides registered for use on carrots and celery. These two species are rapidly being recognized as the most serious vegetable weed pests, with the exception of nutsedge, in Central Florida.

**Crop Culture Methods.**—Long established cultivation and other crop culture methods generally have little influence on the proportions of different weed species present in the fields. Over a long period of time, if other factors are not involved, weed populations remain fairly constant. On the other hand, with increased attention to ditchbank and roadside sanitation or with better cultivation practices, fewer weed seeds of certain species are produced and relative populations change. A notable example of this on the organic soils at Zellwood is the near eradication of giant amaranth, a native plant in the area. This weed, the largest succulent annual that grows in the United States, is very vulnerable to all types of mowing and tillage operations. It is large and brittle and does not flower until fall. This permits mechanical destruction of the plants before seeding both in the fields and along ditchbanks.

**Genetic Adaptation of Species.**—Built-up chemical resistance, or changes in the inherent growth characteristics of the plant, have been responsible for changes in the economic importance of some species. For example, curly dock has been recognized as a perennial ditchbank weed of minor importance at Zellwood for many years. Though seeding profusely at the field margins, it was readily controlled in the crops by cultivation. In recent years, however, seeding curly dock has loomed as a serious winter weed throughout many vegetable fields, presumably because of genetic adaptation. It has caused considerable economic loss, particularly in spinach and other leaf crops grown for
processing. Some weeds appear to have developed resistance to certain chemical herbicides after long-time use. This has been attributed to genetic adaptation, through natural selection and the elimination of the susceptible plants from the population.

CONCLUSIONS

During the relatively brief 15 year period during which these observations were made, there have been numerous changes in the problem weed species in our Central Florida vegetable crop fields. Most of these ecological changes have been due to the introduction of new species through the transportation of contaminated crop seed, transplants, or equipment, but others have been caused by the use of new cultural methods and chemical herbicides, and by the effect of competition between weed species. Genetic alterations also appear to have occurred, permitting the adaptation of some species to better fit their environment or tolerate adverse situations such as those created by the use of selective herbicides.

THE EFFECT OF FERTILITY AND PLANT POPULATIONS ON THE YIELD OF OKRA

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ABSTRACT

Three okra experiments were conducted on Scranton fine sand to determine the effect of 1,000, 2,000, and 3,000 pounds per acre of a 6-8-8 fertilizer and plant spacings at 2-, 4-, 6-, and 8-inches in the row on marketable yield. The 3,000-pound rate of fertilizer maintained a more favorable total soluble salt content in the 0 to 6 inch layer of soil; however, in only one experiment was the linear effect of fertilizer significant on marketable yield. In most cases the 2-inch spacing resulted in the highest yield. In two experiments, treatments had a significant effect on percent nitrogen in the leaves, but there was no significant effect on foliar potassium.