Certain Environmental Factors that May Affect the Growth of Submersed Aquatic Weeds in Florida Canals

By

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Submersed aquatic weeds in irrigation and drainage canals are rapidly becoming a major problem in central and southern Florida. Engineers of the area have long wondered whether canal design can be changed to reduce the growth of submersed weeds in the large irrigation and drainage canals. Before the canal design could be changed, however, information was needed on various biological, chemical, and physical conditions which influence growth of submersed weeds.

Five canals in a 60-mile radius of Fort Lauderdale were studied. Light penetration, phosphorus and nitrogen compounds, sulfates, tannic acid, and turbidity contents of canal waters were found to have the greatest influence on weed growth. Percent of full sunlight present at the 15-ft. depth varied from 0 to 45. Tannic acid and amount of turbidity in the water affected the amount of light which penetrated the water in these canals. The tannic acid was related to area drained by each canal, with the greatest tannic acid concentration being found in canals draining the organic soils of the Everglades. Turbidity appeared to be related to the canal flow, with the greatest turbidity being found in the canals with greatest flow. The depth of maximum submersed weed growth in canals varied from 3 to 12 ft. Above and below these depths the plants were chlorotic or etiolated.

Phosphorus and nitrogen compounds, which are usually growth-limiting factors in the aquatic environment, were found to be relatively high in the canals. These compounds appeared to be entering the canals from leached fertilizers, septic tanks, and sewage treatment plants. The sulfate content was also found to be unusually high in all five canals. Salinity varied from 125 to 450 ppm and appeared to be influenced by the hydrologic head, canal flow, and rainfall.

The findings indicated that canal design can be changed in certain areas to reduce submersed weed growth. However, this would be related to the "angle of repose" of the soil material through which the canals are excavated, or the natural ratio of the horizontal distance to vertical drop of the side slopes.

*Cooperative investigations of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, the Central and Southern Florida Flood Control District, the Corps of Engineers, U. S. Department of the Army, and the Florida Agricultural Experiment Station.

Hyacinth Control In Lee County, Florida

By

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Three years ago this week, the Governor of the State of Florida, signed into law Chapter 61-2404, and thereby created the Lee County Hyacinth Control District, a special taxing district organized to control water hyacinths in Lee County. The purpose of this paper is to report to you that the District has functioned to accomplish its purpose, and in general, has met with acceptance by the tax-paying residents of the county.

Prior to creation of this special taxing district, Lee County was plagued with noxious aquatic weeds — the principal problem being the water hyacinth. Although some control work was carried out as part of a statewide program by the hyacinth control division of the Game & Fresh Water Fish Commission, this effort was limited by a restricted budget and the vastness of the problem area. Generally, these limitations meant that water hyacinth control in Lee County was available only after major streams were completely clogged. When this situation existed, the state hyacinth control crews moved in, and worked to clear our river and the main tributaries. Time and money again prevented control work in many minor streams and farm canals throughout the area, and it was generally accepted that work directed toward the control of water hyacinths was over until the situation became desperate once again, — and thisit did! In 1960, a major infestation of water hyacinths resulted in the Saturday Evening Post including Fort Myers, our county seat, in its "Face of America" series, with the caption "Watery Jungle." The story accompanying the two-page color photograph stated, "In Florida—where these boats sit all forlorn in the Caloosahatchee, near Fort Myers, clearing hyacinths out of inland waters is a never-ending job." To a county which derives some $3,000,000 of its annual income from the tourist industry, this publicity was at best, undesirable.

Taking their cue from this story, and agreeing that control of this problem was, indeed, a "never-ending job," the Lee County legislative delegation acted to implement a program which would provide adequate control on a local basis. After consideration of several alternatives, it was decided to create a special tax district, specifically for the control of water hyacinths. In the interest of economy, the legislative delegation wished to use an existing agency to carry out its purpose, rather than to set up an entire, new organization. Accordingly, they appeared before the Board of Commis-sioners of the Lee County Mosquito Control District; outlined the problem, and requested that the Board consider serving in a dual capacity. After consideration of the facts that someone had to cope with the problem, and that the mosquito control agency seemed best equipped to puruse a program of chemical control, the Board agreed to accept the increased responsibility, provided that the Legislature would authorize such a program and provide funds for an adequate program.

This was accomplished when the act creating the District became law, and the Board was authorized to levy a tax of one-quarter of a mill for this purpose. This tax levy produces slightly more than $50,000.00 annually, and does provide what we feel is an adequate program for the residents of our area.

During the three years of its existence, the Lee County Hyacinth Control District has purchased an office and warehouse adjacent to the mosquito control headquarters; it has acquired boats, motors, pumps, vehicles and other necessary equipment. The District has hired its own personnel, and operates independently of the mosquito control program. However, our three years' experience has assured us that the programs do complement each other. Both equipment and personnel are used interchangeably as the need arises, and quantity purchases under a single contract, reduce the cost of many items for both districts.

In our opinion, the principal advantage of a local district such as ours is the restricted area for which we are responsible. We are close enough to our problem to observe any outbreaks

before they become serious, and to maintain continuous surveillance in order to prevent infestations from getting out of hand. In this respect, inspectors from the Mosquito Control District are most helpful in reporting their observations of hyacinth problems while covering the county on their own work. The residents of the county generally know who to call, and reports of water hyacinth outbreaks are easily telephoned in.

With mosquitoes, at times we can hope that the problem will go away of its own accord. With hyacinths, this is almost never true, and the residents of the county remain happy with the program, since a report of their troubles generally results in visible action within a very short time.

A major disadvantage of a program such as ours is the lack of adequate technical information within our organization. Obviously, a small program oriented to the narrow problems of one county, cannot afford a complete staff, well trained in their field. For much of our technical information, we must look outside of our area for help from others, and it is to this end that we are represented at this meeting.

We feel that a small local program meets the needs of our area and our people, but without the cooperative help of many of you in this room, we would be unable to carry out the effective program which we now enjoy. We appreciate this opportunity to share our experiences with you, and we sincerely trust that you will be willing to share your experience with us for many years to come.

Hazards Encountered In Herbicide Use

By

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Herbicides used in vegetation control programs engender several hazards which are distinct from, but associated with, the inherent toxicity of the specific chemical. Regulation of these hazards under field conditions is dependent upon proper chemical selection and use. Particular reference herein is to aquatic and right-of-way vegetation control programs. More detailed information and suggestions are available (1,2).

PERSONAL HAZARD

Hazards to operating personnel or to by-standers are slight if adequate procedures are followed. Economical, effective herbicides of low toxicity are available for most situations. Appropriate protective clothing and equipment and instruction in safe procedures minimize hazard to operating personnel. Proper application methods should preclude exposure to others. Except in unique cases, there is little justification for using inorganic chemicals.

ENVIRONMENTAL HAZARD

Since herbicides are intended for vegetation control, it is expected that deliberately or accidentally sprayed plants, not tolerant of the particular chemical, will be injured or killed. Responses of other biological organisms in the environment are less well known. The possible effects of control programs on fauna depend, in part, on the specific herbicide. Few of the most widely used, effective herbicides, i.e., dalapon, 2,4-D, 2,4,5-T, have been directly implicated in animal kill under field conditions. Side effects have been noted; aquatic oxygen depression associated with decomposing vegetation. Some of the more toxic chemicals may be usable without major detriment to the more mobile aquatic organisms by selective spraying so that only part of an area is treated on each application date.

Commonly used herbicides may be placed in relative classes which reflect their personal and environmental hazard levels: greater hazard; acrolein, inorganic arsenicals, chlorates, DNBP, PCP and blended solvents, intermediate hazard; amitrole, diquat, endothals, paraquat and TCA, lesser hazard; dalapon, 2,4-D, 2,4,5-T, substituted triazines and substituted ureas.

CULTIVATED PLANT HAZARD

Crop damage is the most common hazard encountered in herbicide use. Many of the ornamental plants of homes, parks and nurseries are sensitive to some herbicides, especially the chlorophenoxy (2,4-D and related) chemicals which visibly affect plant appearance and growth.

Agricultural crops may be damaged in two ways. Illegal herbicide residue contamination of marketable produce is a relatively new but potentially important hazard. Herbicide residue tolerances exist for few vegetable and field crops. The accelerated state and federal monitoring programs may reveal more widespread occurrence of herbicide residues than we realize. The most obvious crop damage is that reflected by plant or fruit appearance, yield and quality (1,2).

IDENTIFICATION OF CROP DAMAGE

Verifying herbicide damage in crops is not always easy. Climate, crop culture, diseases, insects and viruses may induce symptoms similar to injury caused by some herbicides. Generalizations are precluded by differential susceptibility among the crop species. The kind and severity of the symptoms are related to the particular ccrop and intensity of exposure. Mild responses may not be detected. Mainly, injury is ascertained by visual examination of plant roots, stems, branches, leaves and fruit. Characteristic damage syndromes are associated particularly with the chlorophenoxy herbicides (1,2). When exposure is heavy, plants may die before symptoms can develop. Apparent or true recovery may occur and exposed plants may not be examined when definite symptoms exist. Corraborative symptoms from susceptible weed plants are useful. In some cases, sensitive analytical techniques may detect very small quantities of herbicide on or in plant tissue.

CAUSES OF CROP DAMAGE

Poorly controlled application, the most common cause of crop damage, may result from improper choice of chemical, misapplication to sensitive plants, or, most frequently, chemical drift as a fine mist from the spray site to sensitive vegetation. Also, treated waters may be used for crop irrigation or pesticide spraying; too little information is available on the fate of herbicides in treated waters.

The basic cause of damage can be ascribed to personnel and operating procedures. Safe chemical usage is based on identification of the vegetation problem, selection of the correct chemical and effective application. Related considerations are locations of sensitive crops, chemical formulation and dosage, application equipment and climatic conditions.

PREVENTION OF CROP DAMAGE

1. By organization (1,2)
   a. Up-to-date base maps of operating areas with susceptible crops designated and with notations of safe wind directions and velocities.
   b. Accurate logs or records of each herbicide appli-