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College of Agriculture, Human
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Cooperative Extension Program

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CONTROL WEEDS WITHOUT CHEMICALS

by
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Small Farms and Integrated Pest Management

Man's struggle to control weeds began with the earliest attempts to cultivate plants, and continues to this present day. Weeds and crops have the same basic requirements and compete for nutrients, water, light and growing space. Since a weed is sometimes considered a desirable plant, the true definition of a weed is: a plant growing where it is not desired or a plant growing out of place.

Effective weed control strategies are dependent upon accurate weed identification and understanding their life cycles. Weeds are grouped on the basis of similar life cycles such as annuals, biennials and perennials. Annual weeds complete their life cycle in one year and reproduce only by seeds. Annuals are subdivided into summer annuals and winter annuals. Summer annuals germinate in the spring, grow during the summer and die in the fall. Winter annuals germinate in the fall, grow during the winter and die in late spring. Biennials require two years to complete their life cycle. During the first year, biennials produce leaves and store food in the roots. The second year biennials produce a flowering stalk, set seed and die. Perennial plants live for more than two years. Perennial weeds can reproduce by seed (sexual reproduction) or by vegetative structures (asexual reproduction) such as stolons, rhizomes, corms, bulbs, tubers and roots. Vegetative reproduction contributes to the difficulty of controlling perennial weeds.

Once the proper weed identification is made, the next step is to select the most cost effective and non-chemical control method. One must also bear in mind that no single approach is total, but may require integrated non-chemical control methods.

There are various non-chemical approaches to the proper control of weeds in gardens. These are discussed in detail as follows:

- (A) **Land Selection:** Do not attempt to plant a garden on land with a history of heavy weed infestation, especially perennial weeds such as nutsedge or bermudagrass. If the choice of land area is not a luxury and you must plant on land with a history of troublesome weeds, then hand weed or deep turn the soil. If the area is hand weeded, remove all visible plant materials and compost for future use as a mulch. After this is done, break soil at least twelve inches deep by use of a hand fork or tractor mounted cultivator, and then form a smooth seedbed. If plant materials were not removed and soil was deep turned, then it is important to leave plant materials buried for at least two months to allow proper decay before forming the seedbed.
- (B) **Seedbed Preparation:** Before planting a crop, prepare a smooth seedbed. Remove all stubble and rocks. If possible prepare soil at least three months in advance of planting crop. This will allow enough time for much of the troublesome weed seeds located in the first two to three inches of the soil surface to germinate and be killed by light cultivation before planting crop.
- (C) **Hand Hoeing:** If your garden area is small and you enjoy the pleasure of hoeing weeds for the exercise, then this method is cheap and very effective. It is important that you hoe weeds when they are small. If weeds are annuals or biennials, then regrowth from existing weeds will not occur and it will not be necessary to remove hoed-out weeds from crop. If weeds are perennials such as nutsedge and bermudagrass, regrowth from underground plant parts will occur. Also, the reestablishment from above-ground plant parts will occur if not removed. This commonly occurs with bermudagrass. Also if hand hoeing is selected as the only source of weed control, then several hoeing will be necessary at least once per two weeks under good moisture conditions.
- (D) **Mechanical Cultivation:** Mechanical cultivation can utilize tractor mounted cultivators, rototiller or hand pushed or horse pulled cultivators. If this method of weed control is used, it must be planned prior to planting the crop. In order for mechanical cultivation to fit into a weed control operation, plant beds must be spaced to allow easy movement of tractors and cultivators. Rows must be evenly spaced and

straight. Land should be level or not too sloped. The growth habit of the crop should be of such so that roots and vines of crop will not be in the path of cultivators. If mechanical cultivation is used, it will require supplementation or hand hoeing or hand pulling of weeds to remove weeds from within the crop rows.

- (E) **Mulching:** Mulching is probably one of the most effective and least total time consuming approaches to weed control in gardens. There are various types of mulches available and may be divided into organic mulch and synthetic mulch. Organic mulches are those of plant origin such as straw, leaves, paper, compost, tree bark and sawdust. Synthetic mulches are those of inorganic origin such as plastics and other petroleum byproducts.

Organic Mulches: Organic mulches may be applied to a weedfree soil surface prior to direct seeding or transplanting of crop. It may also be applied after crop emergence, but before weeds emerge. If weeds have emerged then it becomes more difficult to control weeds by mulching. Mulching with a material, whether it be leaves, straw or bark, should be done with care. The mulch should be spread evenly over the surface of the soil. The mulch materials should not be of too large particles, but should be at least one to three inches thick over the soil to prevent the penetration of light. Mulch materials should be free of weed seeds, insects, diseases and chemicals; therefore it is important that you know the source of the mulch material.

Mulch materials should be heavy enough or densely packed so that it will not be easily displaced by wind and water. Mulch materials of paper, sawdust and tree bark are usually free of weeds, disease and insects. Sawdust, however, can contain excessive amounts of tree sap or wood binding glue (found in sawdust from boards such as presswood and plywood) so it is important that you know the source and quality of the sawdust.

Synthetic Mulches: Inorganic mulches of black plastic is the most widely used synthetic mulch. Some clear plastic mulch is used, but is not desirable since it allows the penetration of sunlight, warms up the soil and encourages weed growth.

Mulching with black plastic is excellent and simple, but could be somewhat expensive and an obstacle to soil moisture penetration. If cost is not a negative factor, then irrigation problems could be easily solved.

At the completion of seedbed preparation, cover individual beds with black plastic and secure edges with soil. If an under-plastic irrigation is planned, the irrigation tubing must be put in place before laying the plastic. Punch holes at desirable spacing and plant crop from seeds or transplants. Holes normally range from two to four inches in diameter. After the planting process is completed, make sure that enough moisture is supplied to each individual plant by means of underplastic irrigation, sprinkler, irrigation or rain. If weeds such as nutsedge penetrate the plastic, then it will be necessary to pull them by hand or overlay the area with another layer of plastic.

In summary, it is important that you plan your weed control strategies prior to planting the crop of choice. Always remember that each crop may require a different control method and will be greatly influenced by the weed species present. Therefore, it is important that weeds are properly identified, soil is properly prepared and crops are planted in a pattern to effectively allow easy weed control.

This *Agriculture & Natural Resources* Fact Sheet is part of a series prepared by the Small Farms Program of the Cooperative Extension Program at Tennessee State University.

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