

PRINCIPLES OF WEED CONTROL AND MANAGEMENT AND ITS EFFECT ON CROP GROWTH AND YIELD

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Abstract: Weed control is the process of limiting weed infestations so that crops could be grown profitably and other activities of man conducted efficiently while weed management is a combination of practices by which weed infestation is kept to the minimum for successful and profitable crop production. Weeds are more harmful pests of field crops as compared to insects, fungi, rodents, storage pests etc. as far as their losses to crop produce are concerned. Weeds compete with growth factors like fertilizers, irrigation moisture, space, light, etc. with all field crops throughout their life period. In weed control we seek to limit the growth of unwanted plants, both in space and time, without any attempt to eliminate them from the scene. Depending upon the type and density of these weeds, a tremendous loss is caused to the crop in which these are associated. The extent to which any weed growth is desired to be limited will depend upon the cost of weed control and the benefits anticipated from the operation. The aim of weed control is to manage the vegetation on land and in water bodies in such a way it will encourage the growth of plants beneficial to our interest at a particular place and time, and will suppress the remaining, relatively unwanted plant species. The various practices used to control or eradicate the weeds have been examined in this study.

Keywords: weed control, management, growth and yield.

WEED

In natural habitat there are four types of plants: crop plants, wild plants, rogue plants, and weed plants. Crop plants are those which are intensely cultivated by man for his welfare. Wild plants are those which grow voluntarily in nature in an uncontrolled way and do not interfere with man's activities. Rogues are off type economic crop plants in same crop fields. Weeds are those plants which are out of place, unwanted, non-useful, often prolific and persistent, competitive, harmful, even poisonous which interfere with agricultural operations, increases labour, add to costs, reduce yields and detract from comforts of life (Rana and Rana, 2019).

Weeds are defined in many ways, but most definitions emphasize behavior that affects humans. The most basic concept of weed science is embodied in the word 'weed' itself. Each weed scientist has a clear understanding of the term, but there is no universal definition that is accepted by all scientists (Rana and Rana, 2019). Jayakumar and Jagannathan, 2003) defined weeds as unwanted and undesirable plants that interfere with the utilization of land and water resources and thus adversely affect crop production and human welfare. In a comprehensive term, weed is a plant growing in a place where something is expected to grow. Accordingly, a sorghum plant in a black grain field is referred to as weed and vice-versa also. A weed may be defined as 'undesirable and unwanted plants growing out of their proper place'. Weed can also be defined as 'a plant which grows voluntarily at places where it is not wanted and grows at where other useful plants grow'. Plants are also

considered weeds ‘whose virtues are not known yet’ (Walia, 2010). A weed is defined as ‘a plant that forms populations that are able to enter habitats cultivated, markedly disturbed or occupied by man, and potentially depress or displace the resident plant population which are deliberately cultivated or are of ecological and/ or aesthetic interest’. Although all do not agree on precisely what a weed is, most know they are not desirable (Rana and Rana, 2019)

WEED CONTROL

Controlling composite culture of weeds in the crop field is a difficult task since it is governed by host of factors, namely soil, temperature, rainfall, relative humidity, age of weed flora and their composition/distribution and polarity, formulation and chemical nature of the herbicide. Similarly affected is the herbicide selectivity to crop, which is based on plant, soil environment and herbicide interaction (Das, 2011)

In the crop fields (except some fodder and forage crops sown by broadcasting), the composite weed population usually becomes higher than respective crop density on constant area-basis. Winter season generally encounter less weed problem than wet/rainy season since it hardly rains during winter and the surface few centimeters layer of soil, which contributes maximum towards weed germination during the wet season remains relatively dry (Das, 2011). As a result, weed population and diversity remain lower and the number of flushes of their germination gets reduced in the winter than in wet season. However, the severity of competition irrespective of the seasons depends largely on the relative difference on the time of emergence of crop and weeds and their population size (Walia, 2010).

The various practices used to control or eradicate the weeds may be grouped into three generally categories, namely: prevention, eradication, and control. Prevention, eradication and control are the fundamental principles of weed control. First basic step is to prevent the infestation of a weed in a locality in order to avoid their further spread. If one fails in preventing spread of the weeds, eradication step must be adopted. Eradication is limited on a very small scale and only when suitable methods of complete weed removal are available as eradication is 100 percent control of weeds along with its root system and other propagative parts. Further, if one fails in preventive and eradication techniques then weed control methods must strictly follow in which the objective is to bring down the weed population to a level that economical crop yields are possible (Walia, 2010).

PREVENTION METHOD

Prevention is concerned with measures taken to prevent the introduction and /or establishment of specified weed species in areas that are not currently infested with these plant species. Such area may be local, regional or national in size (Jayakumar and Jagannathan, 2019). It also includes farm hygiene that prevent every year production of seeds, tubers and rhizomes of weed species already present in the farm. Hence, any physical or chemical method adopted with main objectives of not allowing the weeds to set viable seeds is to be considered a part of prevention. No weed control programme can be successful if adequate preventive measures are not taken to reduce weed infestation (Das, 2011). The following prevention measures are suggested for adoption, whenever possible and practicable:

- i. Use of clean seeds
- ii. Use of well rotten farm yard manure
- iii. Crop management practices
- iv. Arresting weed seed movement
- v. Keeping non-cropped area clean
- vi. Uprooting weeds before flowering
- vii. Use of clean farm machinery
- viii. Seed certification
- ix. Weed law
- x. Keeping vigil (Walia 2010, Jayakumar and Jagannathan, 2019).

ERADICATION METHOD

Weed eradication is the complete removal of all live plant parts and seeds from an area. Eradication includes the destruction of seeds as well as vegetative propagules i.e. rhizomes, tubers, creeping roots, bulbs etc. (Rana and Rana, 2019). It is taken to the belief that once a weed is eradicated from an area; it will not reappear unless re-introduced. Eradication is very difficult to achieved or hardly achieved in terms of complete exhaustion of seed bank and vegetative propagules of weeds from soil (Rana and Rana, 2019). Jayakumar and Jagannathan (2019) reported that eradication is the ideal method of control, rarely achieved. Eradication infers that a given weed species, its seed and vegetative parts, have been killed or completely removed from a given area and that the weed will not reappear unless re-introduce to the area. Practices aimed at eradication are often used in high value areas, such as green houses, ornamental plant beds and containers. The greatest difficulty in achieving eradication is the killing of the weed seeds and vegetative reproductive parts present in the soil (Rao, 2000)

CONTROL METHOD

Weed control includes many techniques used to limit weed infestations and minimize competition. These techniques attempt to achieved a balance between cost of control and crop yield loss, but weed control is used only after the problem exists. Weed control techniques have been adopted widely because control is the easiest thing to do and is usually effective (Rana and Rana, 2019).

Control encompasses those practices where by weed infestation are reduced, but not necessarily eliminated. Weed control is a matter of degree ranging from poor to excellent. In generally, the degree of weed control obtained is dependent on the characteristics of weeds involved and the effectiveness of the methods of control used (Jayakumar and Jagannathan, 2019). The various methods of weed control are grouped as cultural, mechanical, biological and chemical methods (Walia, 2010).

POINTS TO BE CON SIDERED FOR SUCCESSFUL CONTROL

- i. Habitat of weed plant
- ii. Life cycle of the weed
- iii. Susceptibility to chemicals
- iv. Dormancy period of weed seeds
- v. Resistance to adverse conditions without losing viability
- vi. Methods of weed reproduction
- vii. Dispersal of weed seeds (Jayakumar and Jagannathan, 2019)

WEED MANAGEMENT

All crops grown in the field are subject to weed competition. Weed competition is one of the most important limiting factors in crop production, successful elimination of this factor is directly linked to the production efficiency of the farm (Rao, 2000).

Weeds problems vary from one crop to another, from one region to another, from one farm to another. Similarly, the weed spectrum in heavy clay soils is not always the same as in lighter soils. Weed growth is more intensive in warm, humid, and high rainfall areas than in hot, dry and low rainfall areas. However, since weeds can adapt even to extreme climatic conditions, they are always competitive with crop plants in any situation (Walia, 2010).

Weed management is a combination of practices by which weed infestation is kept to the minimum for successful and profitable crop production. The concept of weed management can be applied as coordinated approach to a single weed species or a complex of several species. Weed management is a system approach whereby whole land use planning is done in advance to minimize the inversion of weeds in aggressive forms and given crop plants a very strong competitive advantages over the latter (Mirza, 2019).

OBJECTIVES OF WEED MANAGEMENT

The primary objectives of the weed management system is to maintain an environment that is as detrimental to weeds as possible by employing both preventive and control measures through the use of physical, cultural, biological, and chemical methods either alone or in combination. The main aim of weed management is to manage the vegetation on land and water

bodies in such a way as will encourage the growth of plants beneficial to humans and will suppress the remaining unwanted plants (Rana and Rana, 2019). The long term objective of weed management is to avoid or reduce any adverse environmental impact of control methods and to prevent buildup of any one weed species (Rao, 2000)

PRE-REQUISITE OF SUCCESSFUL WEED MANAGEMENT PROGRAMME

- i. One must gain knowledge of the biology of weeds before choosing a system for control
- ii. The nature of weed problems must be surveyed in the target area
- iii. Weed control measures must be planned for the whole farm and just against weeds in a field
- iv. Weed control system must follow up programme of weed prevention measures (Mirza, 2019).

CROP MANAGEMENT PRACTICES

Good crop management practices that play an important role in weed prevention are as follows:

- i. Cultivating fast growing crop varieties that serve as better competition with their leaf canopy covering the ground rapidly to enable them to smother the establishing weeds.
- ii. Preventing the weed seed production in cropped and non-cropped areas. This important measures prevents infestation. The persistence of annual and biennial weeds depends upon their ability to produce seeds to re-infest the soil. One could eventually eliminate most of the weeds, if the seed production in weeds are avoided. This could be achieved by cutting, mowing, or killing the weeds before they bloom and set seeds.
- iii. Besides, proper placement of fertilizer, better irrigation practices, high plant population per unit area and proper crop rotation prevent successful establishment of weeds.
- iv. Intercropping with quick growing crops smother the weed in interspaces of row drilled crops (Jayakumar and Jagannathan, 2019)

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