INFORMATION ABOUT WEEDS AND CROP PLANTS

“There is nothing either good or bad, but thinking makes it so”.

- W. Shakespeare.

4.1. INTRODUCTION:

Jethro Tull (1731) was the first person to use the word weed in literature in his famous writing on ‘Horse Hoeing Husbandry’. The weed was defined as “a plant growing where it is not desired”. Baker (1965) has defined weed as “a plant is a weed if, any specified geographical area, its populations grow entirely or predominantly in situations markedly disturbed by man (without, of course, being deliberately cultivated plants)”. Though it is not easy to define weed satisfactorily, various workers have defined the term weed in different contexts as:

“A plant whose virtues have not yet been discovered” (Emerson, 1878);
“Persistence and resistance to control” (Gray, 1879);
“Competitive and aggressive behavior” (Brenchley, 1920);
“Appearing without being sown or cultivated” (Brenchley, 1920);
“Useless, unwanted, undesirable” (Bailey, 1941);
“A plant that grows spontaneously in a habitat greatly modified by human action” (Harper, 1944);
“Unsightly” (Thomas, 1956);
“A plant out of place” (WSSA, 1956);
“A plant growing where it is not required” (Shaw, 1956);
“Weeds are plants but are weeds simply when they are growing where they are not wanted” (Cumming, 1977);
“Weeds as an undesirable, injurious, unsightly trouble-some plants which interfere with cultivated crops and affect human affairs” (Thakur, 1984).

In this sense, it is very important that plants listed as weeds are attributed by the situation in which they adversely affect man’s affair or social life.
Weeds are unwanted and undesirable plants, which interfere with the utilization of land and water resources and thus adversely affect human welfare. They can also be referred as plants out of place. Weeds compete with the beneficial and desired vegetation in crop lands, forests, aquatic systems etc., and poses great problem in non-cropped areas like industrial sites, road or rail lines, air fields, landscape plantings, water tanks, water ways etc.

Weeds are an important factor in the management of all land and water resources, but its effect is greatest on agriculture. There is no reliable study on worldwide damage due to weeds. However, it is widely known that losses caused by weeds exceed the losses from any other category of agricultural pests like insects, nematodes, diseases, rodents etc. Today, yield loss of major crops is approximately 51.8 %, due to the pests 11.2 %, diseases 16.6 % and weeds 24.0 % worldwide (Oerke and Steiner, 1996). Under field conditions, weed infestation is a major problem. These weeds compete with crops for soil moisture, nutrients, light and space and thus reduce crop yields.

But it is also true that while all unwanted plants are weeds, all weeds are not unwanted plants (Oudhia et al., 1999a). In ancient Indian literatures, it is clearly mentioned that every plant on this earth is useful for human beings, animals and for other plants (Oudhia, 1999). Scientists around the world are working hard to find out different uses of these weeds. Moreover, some weeds may have harmful effects on crops because of the chemical substances they release from their leaves and roots into the environment but few substances may have beneficial effects on some plant species.

4.2. HARMFUL EFFECTS OF WEEDS:

Weeds extend the harmful effects slowly, steadily and inconspicuously and the effect is almost irrevocable. Weeds may affect man’s agricultural and non-agricultural activities through various ways. Some harmful effects of weeds are described below:

4.2.1. Reduction in land value -

Weeds reduce the value of the land. Heavy infestation by perennial weeds could make the land unsuitable or less suitable for cultivation resulting in loss in its monetary value.

4.2.2. Limited choice of crops -
Crops differ in their ability to compete with weeds. In many instances, the presence of particular weeds in fields limits the choice of crops to be grown. Very heavy weed infestations render some economically important crops, particularly pulses, jute and forage crops, unsuitable or less suitable for cultivation.

4.2.3. Increases cost of labourer -

Presence of weeds increases the cost of agriculture and hinders the progress of work. Because of weeds more time is spent in land preparation and cultivation, cleaning, irrigation and making drainage channels, harvesting and cleaning grains.

4.2.4. Increases cost of disease control -

Weeds harbour insects, pests, nematodes, pathogens, parasites and microorganisms. Weeds serve as hosts for insects and disease organisms, which move parasitize near by crop and ornamental plants (Wood Powell Anderson, 1983). Weeds like wild oats and some perennial grasses harbour pathogens of black stem rust of wheat. By harbouring these insects and pathogens, their attack on crop plant is increased. This results in increased cost of their control.

4.2.5. Reduction in crop yield -

Weeds grow in the fields where they compete with crops for soil nutrients, water, light and space and believed to decrease crop yields. More water and nutrients are necessary to raise a ton of weeds than to raise a ton of most crops. Reduction in crop yield has a direct association with weed competition. Generally, an increase in one kilogram of weed growth corresponds to reduction in one kilogram of crop growth. Weeds remove plant nutrients more efficiently than crop plants. Competition for light and space with the concomitant reduction in photosynthesis leads to crop losses (Thomas and Muzik, 1970).

4.2.6. Loss of quality of crop produce -

In crop lands and forests, weeds compete with the beneficial and desired vegetation, reducing the yield and quality of produce. The quality of leafy and other vegetable crops suffers on account of weeds. Contamination of other noxious weed seeds greatly reduces the value of crop seeds and grains and sometimes even renders them unmarketable.

4.2.7. Reduce human efficiency -

Weeds cause health hazards to man and animals. They reduce human efficiency through physical discomfort caused by allergy and poisoning. Weeds also
cause itching, hay fever and other debilitating allergies which may contribute markedly to chronic human illness and suffering.

Poisoning of human beings by weeds is probably rather rare but though grazing animals often avoid poisonous plant pasture, they do not invariably do so and if they are unable to discriminate against them in hay or silage, serious losses can occur (Crafts and Robbins, 1962).

### 4.3. BENEFICIAL EFFECTS OR USES OF WEEDS:

Weeds are undesirable plants, but since they grow everywhere so freely and in abundance, the native many countries tend to utilize them. Weeds are valued for increasing organic matter content in soil, increasing soil fertility, checking soil erosion, inducing soil formation, as food and feed and some have medicinal values. Some of the potential benefits of weeds are listed below:

#### 4.3.1. Weeds as food -

Many plants that are sometimes considered weeds are prized as nutrient rich vegetables or medicinal all over the tropics. Some weeds are edible and are great in salads or as greens (dandelions, chickweed, dock, epazote, fennel, Himalayan blackberry, lamb-squatters, miner’s lettuce, mint, mustard, nasturtium, New Zealand spinach, onion lily, purslane, shepherds-purse, sorrel and wild radish).

Weeds also can be an important source of food for wildlife, especially birds. Bird populations have been declining on farmland over the last few decades and leaving weeds as a resource has been shown to help revive bird population.

#### 4.3.2. Weeds as forage -

In India and many other developing countries, often landless laborers collect and carry home, heaps of weeds from crop field and uncultivated areas to feed their cattle. Grasses, cattle reeds, water hyacinth, camel-thorn chicory and prickly pear are commonly used for this purpose in India.

#### 4.3.3. Weeds as source of proteins -

Pirie (1970, 1971 and 1973) and several other scientists have shown that leaf proteins (and carotene) extracted from many weed plants for human consumption. In Japan and China, certain algae viz. *Chlorella pyrenoides* are consumed for their proteins. The protein deficient population of the developing nations will welcome it greatly if low cost quality leaf proteins could be extracted from certain weeds by food technologists (Gupta and Lamba, 1973).
4.3.4. Weeds as flavour plants -
Chicory (*Cichorium intybus* L.) a noxious weed of berseem and lucerne fields is cultivated on limited scale in Gujarat for its seeds that are ground with seeds of coffee to improve its flavour. The plant however cannot be allowed to grow and set seeds in crop fields where it will lead to intense weed problem.

4.3.5. Weeds as allelopathic and medicinal value -
Allelopathic (Oudhia *et al.*, 1996; Oudhia and Tripathi, 1997a, b; Oudhia and Tripathi, 1998a), industrial (Oudhia and Tripathi, 1999a, b) and medicinal (Oudhia and Dixit, 1994; Oudhia and Tripathi, 1998b, c; Oudhia *et al.*, 1998b) uses of many common problematic weeds have been reported. Many studies conducted by Department of Agronomy, Indira Gandhi Agricultural University (IGAU), Raipur (India) have revealed that farmers can earn additional income by selling the different valuable parts of useful weeds in national and international drug markets with the help of village level co-operative societies (Oudhia and Tripathi, 1999c). Weeds are potential sources of valuable life saving drugs and have high medicinal importance.

4.3.6. Weeds as soil conservative -
Weeds help to conserve soil moisture and prevent erosion. A ground cover of weeds will reduce the amount of bare soil exposed helping to conserve nutrients, particularly nitrogen, which could otherwise be leached away, especially on light soils.

Bare ground losses moisture to the air on sunny days and soil to erosion when it rains. A healthy ground cover of living plants will conserve moisture and prevent erosion and weeds can be part of the ground cover. Some deep-rooted weeds open up the subsoil to water and to the roots of more delicate plants (lambsquarter, sowthistle, vetch, wild chicory, plantain, purslane and nightshade).

4.3.7. Weeds as green manure and compost -
In ancient Indian literatures, it is mentioned that all weeds are not harmful (Oudhia, 1999b). Many studies conducted at the Department of Agronomy, IGAU, Raipur have revealed that all weeds present in crop fields are not injurious to crops (Oudhia, 1999c; Oudhia *et al.*, 1999). These studies also revealed that many weeds are beneficial to crops and with the help of these weeds farmers can improve the crop performance.
Certain leguminous and other low C:N ratio weed plants can be used as green manure before they set seeds (Suryawanshi, 1998). They can be dug into the soil as a green manure. Crotons (Croton sparsiflorus) growing on bunds and abandoned fields are used in South India for green manuring rice fields and Camel thorn (Alhagi camelorum) and Pluche (Pluchea lanceolata) in sandy soils of North India. The possibility of converting weeds into compost and ash manure is an important area of research on utilization of weeds particularly in view of current shortage of fertilizers and high N and K$_2$O content of many weeds (Suryawanshi, 1998).

Most of the weeds can be used to make compost or left on the soil surface after cutting, to serve as mulch and to feed earthworms and other soil organisms.

**4.3.8. Weeds in crop breeding** -

Weeds are valued as source of genetic material for crop improvement. Many wild relatives of crops have been the main sources of pest resistance, hardness against environment stresses like frost and drought and other unique traits essential for successful crop improvement (Creech and Reitz, 1971). Several sugarcane and potato cultivars are as a result of crosses with specific weeds.

**4.3.9. Weeds attract beneficial insects** -

Butterflies, spiders, bees, dragonflies, praying mantis, ladybugs and other insects need food and habitat to thrive. Many weeds also provide pollen for bees and serve as refuge for certain beneficial insects (fennel, mustard, wild radish, pigweed and white sweet clover).

**4.3.10. Weeds for paper and fiber pulp** -

Certain aquatic weeds have been tested as source of paper pulp but the yield of the pulp and the quality of the paper product from them are low. This is chiefly because of poor cellulose content of weeds. The possibility of improving cellulose content of weeds by chemical treatments has been shown, though more information on this aspect is needed (Nag, 1973). Attempts are being made to produce fiber pulp from weeds.

**4.3.11. Weeds are pollution indicators** -

Weeds are valued as indicator plants to indicate the incidence of disease, deficiency, disorders etc. Weeds can also be valuable indicators of growing conditions in a field, for example of water levels, compaction and pH.
Some weeds can be used as pollution indicators of air pollution (Heggestad and Heck, 1971), viz. Wild mustard is an extremely sensitive indicator of NH₃, Cl and NO₂ present in air. Lambsquarters and Chickweed are very sensitive to H₂S and SO₂ respectively. These two gases are common air pollutants in industrial areas.

4.3.12. Miscellaneous uses of weeds -

Weeds are valued for economic utilization. Imperata cylindrica and Saccharum munjo are used for thatching roofs. Munjo grass (S. munjo) is highly valued for making ropes and its strong culms are weaves into garden chairs. Cyperus rotundus and Andropogon squarrosus are used for making joss stick. Cymbopogon citratates and C. martini are used for essential oils. Tiger grass (Saccharum spontaneum) is utilized in Madhya Pradesh and Uttar Pradesh for thatching and making ropes. Volunteer plants like African rue (Peganum harmala) and Tephrosia (T. vagelic) are good sources of vegetable insecticides. Leaves of Lambsquarters (Chenopoidum album), Pigweeds and Digera (D. arvensis) are used by some people as vegetables. Prickly pear (Opuntia spp.) is utilized in Madhya Pradesh and Uttar Pradesh for thatching and making ropes. Its pods form food for certain dye producing insects.

4.4. DOMINANT WEEDS OF THE MARATHWADA REGION:

4.4.1. Achyranthes aspera -

Marathi : Aghada, Aghara.

Hindi : Apang, Chirchira, Chichda, Chichiri, Chirchita, Latjira,

English : Prickly-Chaff flower.

Latin : Achyranthes aspera Linn.

Family : Amaranthaceae.

It is found throughout tropical Asia, Africa, Australia and America. An abundant weed in dry places and wastelands, from the seashore to 2,100 m high.

It is an annual or perennial herb. Stem erect, procumbent, 0.5 - 2.0 m high, base woody, angular or ribbed, simple or branched often tinged with pink colour, nodes bulged. Leaves opposite, petiolate, ovate-elliptic or obovate-rounded, in various sizes. Flowers are in auxiliary or terminal spikes, greenish white, bracteate and bracteolate. Perianth lobes 4 - 6, glabrous, shining, ovate, oblong and pointed.
Stamens 5 in numbers, staminodes are truncate, fimbriate; ovary oblong, sub-compressed and ovule solitary. Fruit easily disarticulate oblong or ovoid and utricle. Seeds inverse and testa coriaceous.

It has pungent, astringent, diuretic, alterative, antiperiodic and purgative properties. Plant is used in piles, skin eruptions, ophthalmia, dysentry eye and liver complaints, rheumatism, scabies, bronchial affections and in leprosy. Along with *Piper longum* for mad dog bite. Leaves useful in gonorrhoea and roots in cancer, stomach troubles and bladder stones. Seeds are useful in renal dropsy, bronchial affections and in leprosy. Branches and roots are used as tooth brushes.

### 4.4.2. *Cassia tora* -

Marathi : Takla, Tarwad, Tarwat, Tarota.
Hindi : Charota, Chakvad, Chakavat, Chakod,
       Chakunda, Panevar, Pawand, Pamad.
English : Coffee weed, Foetid cassia, Sickle pod,
       Sickle senna, Wild senna, Ringworm plant,
       Tavara.
Latin : *Cassia tora* Linn.
Family : Fabaceae.

In India, it occurs as wasteland rainy season weed. It is an annual foetid herb, 30 - 90 cm high. Leaves pinnate, up to 10 cm long rachis grooved, conical gland between each of two lowest pairs of leaflet, leaflets in 3 pairs, opposite, obovate, oblong and base oblique. Flowers in pair in axils of leaves, petals five, pale yellow. Fruit pod obliquely separate. Seeds 30 - 50 rhomboidal in shape. Flowering time after the monsoon rains (in Indian conditions). Useful parts are roots, leaves and seeds.

According to ayurveda, the leaves and seeds are acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardiotonic and expectorant. The leaves and seeds are useful in leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis and cardiac disorders.
4.4.3. *Crotalaria notonii* -

Marathi : Diwali.

Latin : *Crotalaria notonii* Wt. and Arn.

Family : Fabaceae.

It is found frequent on slopes of hills, around fields and on wasteland. An annual herb, diffuse with slender erect branches, 30 - 60 cm high, branches with ascending oppressed and spreading pubescent. Leaves 3 foliate, acute and persistent. Leaflets oblanceolate, 10 - 17 mm; inflorescence raceme, terminal and leaf opposed, 25 - 50 mm long. Flowers axillary, small and yellow, calyx 4 - 6 mm long, upper teeth widely separate, corolla 8 - 10 mm long. Pods small, somewhat globose, 4 mm diameter, grooved and shortly beaked, pubescent, 2 seeded. Seeds reniform, pale yellow.

4.4.4. *Parthenium hysterophorus* -

Marathi : Congress gawat, Chatak chandani, Osadi, Gajar gawat, Safed topi.

Hindi : Congress ghas.

English : Parthenium weed, Bitter weed, Carrot grass, False ragweed, Ragweed parthenium, Fever few, White head, Santa Maria.

Latin : *Parthenium hysterophorus* Linn.

Family : Compositae (Asteraceae).

It is a native of tropical America, but widely naturalized in low elevation, dry pastures or along roadsides (Wagner *et al*., 1999).

*Parthenium* is a fast maturing annual or under certain conditions, a short lived perennial. It can grow to a height of 2 m. Its leaves are pale green, branched (deeply dissected) and covered with soft fine hairs. The small white flowers (4 mm across)
have five distinct corners and grow on the stem tips. Each flower produces four or five back wedge shaped seeds that are 2 mm long with thin white scales.

In book “Dictionary of Economic Plants in India”, *P. hysterophorus* is used as tonic, febrifuge and emmenagogue. Root decoction is useful in dysentry (Singh *et al.*, 1996). It is also reported as promising remedy against hepatic amoebiasis (Sharma and Bhutani, 1988). In the Caribbean and Central America, *Parthenium* is used as folk remedy (Navie *et al.*, 1996). It is applied externally on skin disorders and decoction of the plant is often taken internally as a remedy for a wide variety of ailments (Dominguez and Sierra, 1970; Morton, 1981). In Jamaica, the decoction is used as a flea repellent both for dogs and other animals (Morton 1981).

### 4.4.5. *Tephrosia hamiltoni* -

Marathi : Sharpunkha, Unhali.

Hindi    : Sarfonka, Sarfoka.

English : Purple Tephrosia, Wild indigo.

Latin  : *Tephrosia hamiltoni* Drumm.

Family : Fabaceae.

It is very common in grasslands, on wasteland and along roadside. An annual shrub 30 - 60 cm tall, branches zigzag, angled, grey, pubescent. Leaves pinnate, 6 - 10 cm long, leaflets 9 - 15 oblanceolate. Flowers pink in extra axillary raceme. Pods linear, 2.5 - 4 cm, apiculate, 4 - 6 seeded. Seeds oblong and pale yellow. Roots, leaves and seeds are used in medicine.
4.5. SOME CROPS OF THE MARATHWADA REGION:

4.5.1. Maize -

Marathi : Maka.

Hindi : Makai, Makka, Butta, Junri, Kukri,

Bara jowar.

English : Indian corn, Maxie.

Latin : Zea mays Linn.

Family : Poaceae.

Maize is a native of America, widely cultivated throughout the world (Canada, China, India, Brazil, France, Indonesia and South Africa).

It is an all monoecious annual grass with overlapping sheaths and broad conspicuously distichous blades. Plants have staminate spikelets in long spike like racemes that form large spreading terminal panicles (tassels) and pistillate inflorescence in the leaf axils, in which the spikelets occur in 8 - 16 rows, approximately 30 cm long, on a thickened, almost woody axis (cob). The whole structure (ear) is enclosed in numerous large foliaceous bracts and a mass of long styles (silks) protrudes from the tip as a mass of silky threads (Hitchcock and Chase, 1971).

Maize is high yielding, easy to process, readily digested and costs less than other cereals. It is also a versatile crop, allowing it to grow across a range of agro ecological zones. Every part of the maize plant has economic value: the grain, leaves, stalks, tassels and cobs can all be used to produce a large variety of food and feed products. It represents a staple food for a significant proportion of the world’s population. No significant native toxins are reported to be associated with the genus Zea (International Food Biotechnology Council, 1990). It is an important source of carbohydrates, protein, iron, vitamin B and minerals. Green maize (fresh on the cob) is eaten parched, baked, roasted or boiled and plays an important role in filling the hunger gap after the dry season.
In industrialized countries, maize is largely used as livestock feed and as a raw material for industrial products, while in low income countries it is mainly used for human consumption.

### 4.5.2. Spinach

Marathi: Palak.

Hindi: Palak shak.

English: Spinach, Spinage.

Latin: *Spinacea oleracea* Linn.

Family: Chenopodiaceae.

Spinach is native of Asia, probably of Persian origin, being introduced into Europe about the fifteenth century. It grows well in temperate climates. Today, the United States and the Netherlands are among the largest commercial producers of spinach.

The Spinach is a cool season annual plant, cultivated for the sake of its succulent leaves. It is a fleshy leaf annual herb that grows in a rosette. The leaves are glabrous (non-hairy), broad and tender. The leaves may be savoy (puckered or crinkled), semi-savoy and flat or smooth. The plant can bear either male or female flowers (primarily dioecious) on the same plant. The flowers are inconspicuous, greenish-white and are borne in clusters on a spike. Male plants usually grow faster than female. The female flowers develop into seed like fruit. The plant turns yellow as the seeds are reaching maturity. The seeds are round or prickly depending on the cultivator selected.

Spinach is used as a leafy green vegetable and eaten raw in salads. It is also used as a cooked green (potherb) much like turnip greens or collard greens. It is rich in vitamins and minerals, especially folate (folic acid), vitamin A and K, calcium, magnesium, manganese, iron, sodium, phosphorus and potassium. It is exceptionally rich in carotenoids including beta-carotene and lutein and also contains quercetin, a phytochemical with antioxidant properties. It also has high levels of protein.

Ninety-one percent of spinach weight is water. A serving of spinach contains carbohydrates- 4.3 gms; protein- 3.2 gms and fat- 0.3 gms. It also contains vitamin C,
thiamin, riboflavin and niacin. Green leafy vegetables like spinach with its delicate texture and jade green color provide more nutrients than any other food.

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