



## A Survey of Weed Flora in Crop Fields of Satara Tahsil (M.S.), India

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### Abstract:

Weeds cause serious ecological problems. Weeds contribute significantly to reduced crop yield and quality even though several management programmes have been used. The present study was conducted to explore the weed flora in crop fields of Satara tahsil in Maharashtra state. The study was based on extensive and intensive field surveys made in different months of Kharif and Rabi seasons during 2012- 2013. Crop fields from the study area were surveyed for the weed population studies. A total of 85 angiospermous weeds were identified. Out of 85 weed species, 68 were dicots and 17 were monocots. According to the frequency, three dominant weed species were found to be *Parthenium hysterophorus*, *Ageratum conyzoidis* and *Euphorbia geniculata*.

**Keywords:** Frequency, Most abundant, Population studies, Survey, Satara tahsil, Weed flora.

### 1.0 Introduction:

Weeds are the plants, which grow where they are not wanted. Weeds differ from other plants in being more adaptive and having peculiar characteristics that make them more competitive (Dangwal *et al.*, 2010). They are non-indigenous plants that can invade or negatively alter native plant communities (Muhammad *et al.*, 2009). Weeds represent one of the greatest limiting factors to efficient crop production. They cause greater economic losses on agricultural lands than all other pests combined (Kremer and Kennedy 1996). These weeds effectively compete with the crop for nutrients, water, space and reduce the yield ranging from 12 to 51 % (Rao and Singh, 1997; Mukharjee and Singh, 2005; Halder and Patra, 2007). Weeds also serve as reservoir for plant pathogens that may cause significant loss in crop production. They may also support populations of non-native animals and microbes and hybridize with native species subsequently altering the gene pools (Mahanta *et al.*, 2007). The invasive weeds disturb the structure and composition of the native vegetation and as a result create pressure on the food chain and web of the ecosystem (Pysek and Richardson, 2007; Bais *et al.*,

2003; Pimentel *et al.*, 2000). Weeds establish mutualistic relationship with insect pollinators to successfully invade new area (Jesse *et al.*, 2006; Morale and Aizen, 2006) affecting numerous ecosystems. Certain weeds release into the soil the inhibitors or poisonous substances which are harmful to the plants, human beings and live-stocks. Many weed species are difficult to kill (Farkas, 2006). They increase the expenditure on labour and equipment, render harvesting difficult, and reduce the quality and marketability of agricultural produce.

Agricultural crops serve a source for number of industrial products, besides their major use for human food. The average per hectare yield of these crops in India is less as compared to other advanced countries due to many factors like lack of irrigation, availability of fertilizers and other ecological factors. Out of which the problem of weeds is the major barrier in the loss of production.

Weed flora and its composition in a crop is influenced by the type of cultivation, time or season of cultivation, soil type, soil PH, climatic conditions, cultivation practices like irrigation, tillage systems,

application of fertilizer and weed management. The present study was undertaken to investigate weeds and their predominance in crop fields in Satara tahsil.

**2.0 Material and Methods:**

**2.1 Study area:**

The study area lies in Satara district, situated in west part in Maharashtra State. The Satara district is located between 17° 5' to 18° 11' north latitudes and 73° 33' to 74° 54' east longitudes. It has an average elevation of 742 meters (2434 feet). Satara district has an area of 10,484 km<sup>2</sup>, and a population of 2,796,906 according to 2001 census. The district has 10,58,200 ha geological area of which 7,06,500 ha is under the crop cultivation. This district consists of eleven tahsils. Agriculturally developed Satara tahsil was selected for the study purpose.

**2.2 Methodology:**

The present study was conducted to find out the weed flora in crop fields (viz. Soybean, Rice, Maize, Jowar, Sugarcane and Wheat) of Satara tahsil. The study was based on extensive and intensive field surveys. The weeds survey was conducted during the year 2012-13. The weed survey was made by least count quadrat method (Misra, 1968) using 1 m<sup>2</sup> quadrats. In each field, 5 quadrats were laid down and number of each species in quadrat was recorded. Weeds were then identified (Cooke, 1967; Yadav and Sardesai, 2002). Frequency, an important quantitative Curtis and McIntosh (1950). analytical parameter of weed species was determined as per Frequency percentage refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage occurrence. It was studied by sampling the study area at several places at random and recorded the name of the species that occurred in each sampling units. It is calculated by the equation:

Frequency (%) = Number of quadrats in which the species occurred X 100 / Total number of quadrats studied.

A list of twenty dominant weeds was prepared according frequency of their occurrence.

**3.0 Results and Discussion:**

**Table 1:** List of dominant weed species along with their Families and Botanical names.

Sr. No.	Weed	Family	Frequency (%)
1.	<i>Parthenium hysterophorus</i>	Asteraceae	53.14
2.	<i>Ageratum conyzoides</i>	Asteraceae	48.50
3.	<i>Euphorbia geniculata</i>	Euphorbiaceae	43.35
4.	<i>Sida acuta</i> Burm.	Malvaceae	36.40
5.	<i>Alternanthera sessilis</i>	Amaranthaceae	35.72
6.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	31.20
7.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	28.12
8.	<i>Oxalis corniculata</i> L.	Oxalidaceae	25.45
9.	<i>Amaranthus viridis</i>	Amaranthaceae	23.56
10.	<i>Launaea procumbens</i>	Asteraceae	20.70
11.	<i>Dinebra retroflexa</i>	Poaceae	19.68
12.	<i>Dinebra spp</i>	Poaceae	18.90
13.	<i>Euphorbia prostrata</i> Aiton.	Euphorbiaceae	18.45
14.	<i>Chenopodium album</i>	Chenopodiaceae	17.00
15.	<i>Portulaca oleracea</i> L	Portulacaceae	15.50
16.	<i>Tridax procumbens</i> L	Asteraceae	14.26
17.	<i>Amaranthus spinosus</i>	Amaranthaceae	12.15
18.	<i>Paspalum distichum</i> Acut.	Poaceae	11.50
19.	<i>Euphorbia rosea</i>	Euphorbiaceae	10.20
20.	<i>Cyperus rotundus</i> L.	Cyperaceae	9.56

A total of 85 angiospermous weeds were identified. Out of 85 weed species, 68 were dicots and 17 were monocots. Family Asteraceae, Poaceae, Euphorbiaceae, Amaranthaceae and Malvaceae represented the weed genera. Total number of weeds was less in *rabi* season than *kharif*. During *kharif* season, on the basis of frequency most dominant weed species were *Ageratum conyzoides* L (52.10%), *Parthenium hysterophorus* (49.50%) and *Euphorbia geniculata* (47.20%). The frequency of other weed species ranged from 11.8 to 39.8%. During *rabi* season, the most abundant weeds were *Parthenium hysterophorus* (56.78%), *Ageratum conyzoides* L (44.90) and *Euphorbia geniculata* (36.40%). Throughout the year, according to the frequency, three dominant weed species were found to be *Parthenium hysterophorus*, *Ageratum conyzoides* and *Euphorbia geniculata*.

*Parthenium hysterophorus* L., most dominant weed in our survey is also known as congress grass, ragweed, Carrot weed, white top, star weed. *Parthenium* is a noxious weed native to tropical America. It has now spread in several tropical and subtropical parts of the world (Kohli et al., 2009). It was first reported in India in 1956 growing in the outskirts of Poona (Rao, 1956). Now, it has become one of the major and prominent weed during the last two decades and is still continuing to spread in the urban as well as natural habitats. *Parthenium* weed has been reported from all regions of India. *P. hysterophorus* is an annual, erect herb, reaching a height up to 2 m. The plant has a tap root system with a number of secondary and tertiary roots. The leaves are rhomboidal, dissected and arranged alternatively on the stem. The leaves and stem have small hair-like outgrowths called trichomes. The inflorescence in *P. hysterophorus* is capitulum type having creamy-white coloured flowers. The fruit of the plant is cypsela. The seeds are dark brown, very light in weight and often dispersed by means of air up to several kilometers (see plate-1). *Parthenium* weed is a prolific seed producer capable of producing up to 15,000 seeds per plant. *Parthenium* typically represent greater than 50 per cent of the total soil seed bank. Up to 400 million *Parthenium* seeds per hectare can be present in the surface soil compared to 1, 20, 000 native grass seeds. It is regarded as one of the worst weeds in the nation because of its invasiveness, potential for spread, and economic and environmental impacts. *Parthenium* weed negatively affects the primary agricultural production and also causes health problems in humans and animals.

Contact with airborne pieces of dried plant material, pollen or even roots of *Parthenium* can cause the development of allergic reactions. The symptoms in humans include: severe contact dermatitis, allergic rhinitis, allergic bronchitis. *Parthenium* weed is also toxic to animals and produces pronounced skin lesions on all animals including horses and cattle, mouth ulcers with excessive salivation if eaten, eye irritation in working dogs and death due to rupturing and haemorrhaging of internal tissues and organs.

*Ageratum conyzoides*, second most dominant weed in our survey is also known as Goat weed, Billygoat weed, Chicken weed or Whiteweed. Weed belongs to family-Asteraceae, Order-Asterales, Class-Eudicots, Subkingdom-Angiosperm and Kingdom-Plantae. The plant is known to have originated from tropical America and now spread to various tropical and subtropical parts of the world (Juliana et al., 2010). In India, it was introduced in 1860 as an ornamental plant (National Focal Point for APFISN, India, 2005). Later it escaped as a weed in various habitats throughout India. It is an annual branching herb which grows to approximately 1 m in height. The stems and leaves are covered with fine white hairs; the leaves are ovate and up to 7.5 cm long. The flowers are purple to white, less than 6 mm across and arranged in close terminal inflorescences. The fruits are achene and are easily dispersed while the seeds are photoblastic and often lost within 12 months. Viability of the seeds is often lost within 12 months (see plate-1). It is not eaten by men because of its bad odour, like a male goat and is named goat weed or billy goat weed. *Ageratum conyzoides* has bioactive activity that may have agricultural use, as shown by several research investigations in different countries. This plant is widely utilized in traditional medicine. It has been long known in herbal medicine as a remedy for diverse ailments. The weed have various pharmacological significance like antibiotic efficacy, analgesic effect in rats, antioxidative effect (Jagetia et al., 2003), hepatoprotective effects (Ita et al., 2009) and as a blood booster (Ita et al., 2007). Weed causes severe problems for farmers and ecologists because of its propagation potential. It has been reported as host of many crop diseases. Weeds interfere with growth and production of crops and therefore exert significant ecological and economic impacts. It also produces health hazards to humans and animals. Ingestion of *A. conyzoides* can cause liver lesions and tumors (Fu et al., 2002). Mass poisoning incident in Ethiopia was as a result of contamination of grain with *A. conyzoides*

(Wiedenfled, 2011). *A. conyzoides* causes allergic reactions in some humans.

*Euphorbia geniculata*, is a third dominant weed. It is a troublesome. It has recently spread throughout the tropical and subtropical regions of the world. In India the species was introduced in 19th century and now it is major weed of economically important crops (Mishra et al., 2003). It is an annual herb with a branched stem up to 2 m high. The fruit capsule contains three seeds of about 2 mm long. Reproduction is exclusively by seeds. It is a major threat to the local flora, since it possess higher regeneration potential and seed production potentials. It is characterized by the cyathium, an inflorescence of many reduced male flowers and single female flower and enclosed by a hypanthium like involucre provided with glands. Flowering commences in June and ends in November. The plant is andromonoecious. It is self compatible and male cyathia bloom earlier thus pollen is available prior to female phase in hermaphrodite cyathia, the later being protogynous. Nectar secretion coincides with anther dehiscence in both types of cyathia. Fructose, glucose and sucrose rich nectar is present. *Euphorbia* spp. cause health hazard to humans and livestock. Direct contact of the latex with the eye can cause blindness.

*Sida acuta* Burm. F., commonly referred to as teaweed or ironweed is a weed from malvaceae family that ranks fourth dominant weed in our survey. It dominates improved pastures, waste and disturbed places roadsides (Mann et al., 2003). The weed is native to Mexico and Central America but has spread throughout the tropics and subtropics. It is an erect annual and/or perennial shrub that can grow to a height of three feet. The stems are woody, branching several times, and it has a well-developed tap root. The leaves of *Sida acuta* are light green, slightly concave oval leaves, lance- to rhomboid-shaped with a shiny surface and serrated margins. *Sida acuta* has small yellow flowers that can be solitary or growing in pairs in the leaf axils. The fruit is a dark brown capsule; it splits into six to ten single-seeded segments when ripe. The growing season starts in late spring. *Sida acuta* grows in dense stands along highways, agricultural fields, and the edges of forested lands. *Sida acuta* has several positive attributes that include drought resistance and adaptability to a wide variety of soil conditions. It is a native perennial plant that can tolerate heavy browsing by animals. One weed plant can produce

hundreds of seeds throughout the growing season. Each seed is wedge-shaped, brown to black, with two stiff spikes at the tip (see plate-1). The seeds of *Sida acuta* disperse easily by adhering to clothing, fur, and other fibrous materials, or by moving on machinery or vehicles. Teaweed or ironweed is considered a "weed" in agriculture. The weed reduces crop production, and it is not recommended for planting near agricultural fields.

*Alternanthera Sessilis*, also known as Sessile joyweed, is a perennial herb with prostrate stems, often rooting at the nodes, 10 to 100 cm long. Leaves are obovate, occasionally linear-lanceolate, 1-15 cm long, 0.3-3 cm wide, and petioles are 1-5 mm long. Flowers are in sessile spikes, 0.7- 1.5 mm long. Fruits are utricle 1.8-3 mm long and 1.3-2 mm wide. The plant spreads by seeds, which are wind-and water-dispersed, and by rooting at stem nodes. Seeds are lenticular 0.9-1.5 mm long and 0.8-1 mm wide. Seedlings appear in April, and fruits appear during August-October. It is an invasive plant that competes with crops for valuable nutrients and water. It reduces the yield and quality of crops such as corn, rice, soybeans and vegetables. It grows in both wet and dry environments. In aquatic systems, it can block irrigation pipes and canals.

*E. hirta* belongs to genus *Euphorbia*, family Euphorbiaceae, Order Malpighiales, Class Angiospermae, Phylum Magnoliophyta and Kingdom Plantae. It is frequently seen occupying many crops, open waste spaces and grasslands, road sides, and pathways in many parts of the world. The weed is annual, 30-60 cm tall, usually few branched. Root fibrous, 3-5 mm. Stem branched from middle or above, ascending to erect, rarely prostrate, with mixture of long yellow-brown multicellular hairs and much shorter white hairs. Leaves opposite; stipules membranous, triangular, 0.8-1.7 mm, leaf blade lanceolate-oblong, long elliptic, or ovate-lanceolate, adaxially green to red, abaxially gray-green, both surfaces pilose, base slightly oblique, margin entire or few serrulate below middle, finely serrulate above middle, apex acuminate or obtuse. The leaves of *E. hirta* are found to contain flavonoids, polyphenols, tannins, sterols, alkaloids, glycosides and triterpenoides. Cyathia in dense, often head like, pedunculate cymes at upper nodes, peduncle to 25 mm, all parts very hairy; involucre campanulate, marginal lobes 5, triangular-ovate; glands 4, red, rounded to transversely elliptic, center slightly

sunken, appendages white to reddish, narrowly elliptic to obdeltoid, to 0.3 × 0.2 mm, margin entire to slightly undulate. Male flowers 4 or 5; anthers red. Female flower: pedicel short, exerted from involucre; ovary 3-angular, sparsely pilose; styles free; stigma slightly 2-lobed. Capsule 3-angular, smooth, shortly pilose; fruiting peduncle to 1.5 mm. Seeds subglobose tetragonal, reddish, sides transversely furrowed; caruncle absent. The plant has a reputation for increasing milk flow in women because of its milky latex and is used for other female complaints as well as diseases like bronchitis, asthma, eczema, dysentery. It is used as antidiarrheal, antispasmodic, anti-inflammatory, anticancer and antimicrobial. *E.hirta* is a weed frequently observed in many agricultural crops reducing their yield very significantly.

*Cynodon dactylon* (L.) Pers. is a perennial grass belonging to family Poaceae. It is native to north and east Africa, Asia and Australia and southern Europe. It is cultivated throughout the tropics and subtropics. Roots and stems develop at the nodes. Mats are formed by tough scaly rhizomes, and long branching stolons. They germinate from seeds in summer-autumn. Leaves are green, tufts, up to 15 cms long, with varying degrees of hairyness. Flower heads have 2 – 6 spikes. Seed heads of short spikes, 3-5 cms long at the end of long stem are tightly packed with small hairless seeds, and often have purple pollen sacs hanging from them. The plant contains  $\beta$ -sitosterol, flavanoids, alkaloids, glycosides and triterpenoides. *Cynodon dactylon* contain any chemical constituents like Hexadecanoic acid, Linolenic acid, ethyl ester, Hydroquinone, d-mannose etc. The weed has a variety of medicinal properties. In Ayurveda *Cynodon dactylon* shows many pharmacological activities like antidiabetic, antioxidant, antidiarrheal, hepatoprotective, antiulcer, immunomodulator, antimicrobial and germicidal. The weed has negative effect on many crop yields and is also toxic to animals. It is found to be potentially toxic to sheep, cattle, horses and pigs.

*Oxalis corniculata* Linn. is commonly known as creeping woodsorrel, belongs to the Family Oxalidaceae. The species is a successful invader and seems to be adapted to a wide array of habitats. It is a somewhat delicate-appearing, low growing, herbaceous plant. *Oxalis corniculata* var. shows purple leaves. It is distributed in nearly all regions throughout the warmer parts of India. The plant is a

small procumbent herb; stems rooting and having pubescent with appressed hairs. Leaves are trifoliate, with three small heart shaped leaflets. The petioles are sessile. Flowers are yellow, nearly 1 cm long and the petals are obcordate. Fruits are like capsules, tomentose, subcylindric, 1 to 1.8 cm long, divided into minute segments with numerous black seeds the size of sand grains. Phytochemical investigations of *Oxalis corniculata* Linn. have revealed the presence of tannins, palmitic acid, a mixture of oleic, linoleic, linolenic and stearic acid. Methanolic and ethanolic extracts of this plant show the presence of carbohydrate, glycosides, phytosterols, phenolic compounds, flavanoids, proteins (12.5%), amino acids and volatile oil. It also shows the presence of calcium, fiber and tannin. Leaves contain tartaric acid and citric acids, calcium oxalate, flavones. This herb is well known to have an acid taste due to the high content of oxalate in its leaves and stems. Traditionally the plant is having several medicinal. It is considered as a troublesome weed that successfully grows in agricultural crops, lawns, waste places and gardens. It tends to become especially troublesome in pots growing in greenhouses.

*Amaranthus viridis* Linn. is an upright growing, leafy herb. *A. viridis* is a common plant in certain parts of Asia. It is an annual erect, 10 to 75 cm stem. Leaves are slender, branched, angular, glabrous with long petiolate, 10 cm, lamina deltoidovate to rhomboid-oblong, flowers are green, axillary or terminal, often paniculate spikes. Bracts and bracteoles are ovate to lanceolate-ovate, whitish, pale or reddish, bracteoles shorter than the perianth; flowers are numerous, minute, green or brown, in a compact, terminal spike and in upper leaf axils. Male flowers are oblong-oval, acute, concave, female flowers are narrowly oblong to narrowly spathulate. Stigmas are in 2 to 3 numbers, short and erect. Capsule is subglobose, 1.25 to 1.5 mm. Seeds are 1 to 1.25 mm, round, compressed, dark brown to black and reticulate. The plant is antidiabetic, antihyperlipidemic and antioxidant (Ashok et al., 2010). The plant has antiproliferative and antifungal lectin (Kaur et al., 2006). A decoction of the entire plant is used to control dysentery and inflammation. The weed in agricultural field reduces the crop yield very significantly.

*Launaea procumbens* is a perennial herb, rosulate, branched from base, procumbent to ascending. It shows taproot with shoot-bearing lateral roots. Stems are 5-30 cm, divaricately branched,

puberulent or glabrous, with few leaves or leafless. Rosette leaves spatulate, sinuate-dentate to variously pinnately lobed, tapering into a narrow base, margin white cartilaginous denticulate; lateral lobes 3 or 4 pairs, elliptic to triangular, apex rounded to obtuse; terminal lobe lanceolate to elliptic, apex obtuse. Stem leaves are smaller, base often clasping.

Synflorescence divaricately paniculiform, with capitula frequently clustered. Capitula with 15-20 florets. Involucre cylindric. Phyllaries glabrous, margin broadly white scarious, apex acute to obtuse; outer phyllaries triangular-ovate to linear-lanceolate, to 2/3 as long as inner phyllaries; inner phyllaries. Nutritional analysis showed that *L. procumbens* is composed of salicylic acid, vanillic acid, synergic acid, 2-methyl-resercinol and gallic acid which have antioxidant, liver disorders, anticancer, allelopathic and anti-inflammatory properties.

### Plate-1: Seed morphology of some selected dominant weeds



Seeds of *Parthenium hysterophorus*



Seeds of *Ageratum conyzoides*



Seeds of *Sida acuta*

During present study comparable weed species were recorded as compared to those recorded by earlier workers. Kadam and Khandekar (2009) reported 101 weeds from Satara district with *Ageratum conyzoides*, *Parthenium hysterophorus* and *Acalypha indica* as dominant weeds. Qurehi et.al (2001) and Memon et.al (2003) reported 165, 33, 50 and 24 weed species respectively during their survey. Sit et.al (2007) reported *Ageratum conyzoides*, *Oxalis comiculata*, and *Vandelia* as dominant weeds during their survey.

By considering frequency of weed species, 20 most dominant weeds were identified. Family Asteraceae, Euphorbiaceae and Poaceae contributed 04 genera each, Amaranthaceae contributed 03 genera while Chenopodiaceae, Oxilidaceae, Portulaceae, Malvaceae and Cyperaceae contributed single species each (Table 1 and Plate-2).



**Plates 2: The photographs of dominant weeds captured during the survey**



1=*Parthenium hysterophorus* L.; 2=*Ageratum conyzoides* L.; 3=*Euphorbia geniculata*; 4=*Sida acuta* ;  
 5=*Alternanthera sessilis*; 6=*Euphorbia hirta* L.; 7=*Cynodon dactylon* L.; 8=*Oxalis corniculata* L. ; 9=*Amaranthus viridis*;  
 10=*Launaea procumbens*; 11=*Dinebra retroflexa* ; 12=*Dinebra* spp ; 13=*Euphorbia prostrata* ; 14=*Chenopodium album*;  
 15=*Portulaca oleracea* L.; 16=*Tridax procumbens* ; 17=*Amaranthus spinosus* ; 18=*Paspalum distichum*;

#### 4.0 Conclusion:

1. Current study is based on taxonomic approach of weeds of the different seasons from the agricultural crops of Satara tahsil, which provides a preliminary data.
2. It provides information about the weeds of Satara tahsil.
3. It will also be useful in suggesting suitable weed control recommendation for this region.

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