INTRODUCTION
A weed is a plant that is considered to be nuisant or unwanted plant in human made settings such as garden, lawns or agricultural areas and other natural areas. More specifically weed is a native or non-native plant that grows and reproduces aggressively (http://en.wikipedia.org/wiki/Weed.). The term weed was first coined by Jethro Tull (1731) for unwanted plant growing in unwanted area. Brenchley (1920) states that weeds are the plants that grow luxuriantly or plentifully and chokes out all other economically important plants. He also treats weed as any other plant than the crop sown. Campnell (1923) defines it as honest, impendent competitor for food materials in the struggle for existence. According to Bailey and Bailey (1941) weed is useless, unwanted and undesirable plant. According to Baker (1965) a plant is “weed” if in any specified geographical area, its population grows entirely or predominantly in situations markedly disturbed by man except cultivated plant. Harper (1944) considers it as a plant that grows spontaneously in a habitat that has been greatly modified by human action. It is a plant which interferes with man’s utilization of land for specific purpose (Moore, 1954; Shaw, 1956). Thomas (1956) considers weed as useless, undesirable and very unsightly plant of wild growth. Vaidya et al. (1978) have defined weed as any plant not sown in field by the farmers that is plant which is out of place. Weeds show wide ecological amplitude by means of which they can resist the extreme conditions of environment. In ecology, a species that lives in a wide variety of ecological conditions including unstable ones and those damaged by humans is called as weedy species (http://www.123wikipedia.com).

Weeds are generally classified on their habitat. Weeds of cultivated crop fields (agricultural land) are called agrestals and those of non agricultural land i.e. fallow land, harvested fields, along rail tracks, road–sides, hedges, waste places, on old walls and roof tops etc. are called ruderals. There are some weeds which are not specific to any particular habitat i.e. they act as both agrestals and ruderals.

*Parthenium hysterophorus* is an annual aggressive exotic weed of the family Asteraceae (Compositae), native of tropical south and North America and West Indies (Castex et al., 1940; Fernald, 1970; Arny, 1987). It has been reported in the countries like Mexico (Fernandez et al., 1942), South Africa, Mauritius, Rodrigues, Seychelles, Vietnam (Krishnamurthy, 1977), Israel (Joel and Liston, 1986), Australia (Navie et al., 1996), Taiwan (Peng et al., 1988), Nepal (Mishra, 1991) and Ethiopia (Medhin, 1992; Seifu, 1990). In India it was first reported in vicinity of Poona in 1956 (Rao, 1956; Santapau, 1967). It entered in India as an escape during the import of wheat
from America in 50s (Vartak, 1968). The genus Parthenium includes 20 species, out of these only one species that occurs in India as an exotic weed is P. hysterophorus (Haskoo, 1963; Patil, 1980). Now it occurs almost all over India (Haskoo, 1963; Hosmani and Setty, 1973; Bibhas Ray, 1975; Patil et al., 1976 Krishnamurthy et al., 1977; Hegde and Patil, 1980). It spread rapidly in West Coast of Maharashtra (Ranade, 1975) and also in Karnataka. It is quick to invade disturbed areas such as those along roadsides and railways, cleared areas and croplands and mismanaged rangelands. It has pantropical distribution because of its wide range of ecological adaptations (Vartak, 1976; Hegde and Patil, 1980). The weed is generally regarded as noxious as it affects crop production, animal husbandry, human health and biodiversity. It shows allelopathic characteristic which is believed to be an important attribute contributing to the successful spread of species. Several scientists have conducted chemical studies and bioassay to understand allelopathy (Rajan, 1973; Kanchan, 1975; Kanchan and Jaychandra, 1979, 1980; Patil and Hegde, 1988; Adkins and Sowerby, 1996). In Parthenium, phenolics and sesquiterpene lactones have been identified as two major groups of allelochemicals.

Cassia is the 4th largest genus in the family leguminosae, the largest genus in the subfamily Caesalpinioideae, among the 25 largest genera of dicotyledonous plants. The 600-odd species of Cassia abound in warm regions throughout the world and few are found in temperate areas. Species range in habit from prostrate, annual herb to tall forest trees (Allen and Allen, 1976). There are some weedy species of Cassia, found growing luxuriantly in some regions of Kolhapur district. The genus Cassia includes 19 species out of which 8 are trees and 11 are shrubs or herb species found at Kolhapur (Yadav and Sardesai, 2001). The herb or shrub species in Kolhapur region are Cassia alata, C. absus, C. pumilla, C. mimosoides, C. tora, C.obtusifolia, C. uniflora, C. sophora, C. occidentalis, C. hirsuta and C. auriculata. Among those the species like C. obtusifolia, C. tora and C. uniflora are growing luxuriantly.

Various workers have suggested that Cassia species had potential for biological control of P. hysterophorus. First observation was made by Singh (1983), who noted that Cassia uniflora moved into areas previously occupied by Parthenium in Maharashtra. Subsequently Naithani (1987) also observed that Cassia sericea had an ability to smother Parthenium in Arunachal Pradesh and Nagaland. While in Bangalore Mahadevappa and Ramaiah (1988) reported reduction in vigour of Parthenium by C. uniflora. Later the presence of inhibitory or allelopathic substances
in aqueous extracts of *C. uniflora*, which affected both the germination and growth of *P. hysterophorus*, was discovered by Jayakumar *et al.* (1989). Joshi (1991 a, b, c) also reported potential of *C. uniflora* as biological control of *P. hysterophorus*.

**Cassia obtusifolia** (L.) (Plate No. 1)

*Cassia obtusifolia* (L.) is a wasteland predominant moderate shrub. There are different common names for this plant in different regions. e. g. Marathi- Takala; Hindi-Charota, Chakavad, Chakvat; Bengali and Oriya-Chakunda; Gujarati-Kawaria; Canarese-Kawaria

*Cassia obtusifolia* is distributed in wastelands throughout India (Siddhuraju *et al*., 1993) and tropical and warm temperate regions of the world (Irwin and Turner, 1960; Teem *et al*., 1980). *C. obtusifolia* is an annual herb growing 2-7 ft high. Leaves pinnate, rachis grooved, with a conical gland between the lowest pair of leaflets only, stipulate. Leaflets 3 pairs, opposite, the lowest pair the smallest, obovate-oblong, base somewhat oblique. Flowers usually in subsessile pairs in the axil of the leaves, calyx glabrous, petals 5, bright yellow, stamens 10, of which 3 upper are reduced to small staminodes, remaining 7 perfect of which 3 largest. Pods sickle shaped, seeds 25-35, rhomboidal.

It is medicinally important plant and also has commercial importance as a source of gum (Abbott *et al*., 1998; Wu and Abbott, 2005). It possesses antimicrobial, antimitagenic and antiallergic properties (Kitanaka and Takido, 1986; Friedman and Henika, 1991; Yun-Choi *et al*., 1990; Kitanaka *et al*., 1998 and Dougari *et al*., 2008). The plant also has larvicidal activity (Jang *et al*., 2002 and Yang *et al*. 2003). Its seeds and leaves have nutritional values. Along with nutritional factors it also has some antinutritional factors. If the antinutritional factors are removed from it, it can act as a source of protein, carbohydrate and minerals. Anthraquinone is considered as main toxic compound, but it had medicinal importance.

Singh and Premnath (1992) reported various medicinal uses. The leaves of this species can be used to treat tuberculosis and ringworms. The root extract along with lime juice can be applied to ringworms. Ground seeds mixed with sour buttermilk can be used to cease the irritation of itchy eruptions. The leaves sauteed in castor oil and can be applied to foul ulcers. In China, the pods are used in dysentery and ophthalmia treatments. Seed preparation is used as a purgative in Japan and China (Crawford *et al*., 1990). Seeds are also used for treatment of red and tearing eyes, headache and
dizziness (Jiansu, 1975). Gunjatkar and Vartak (1982) reported that the tribal people living in the hilly region of the Pune district, Maharashtra, eat the roasted seeds of this species. In Bombay, Assam and Goa the seeds are used as substitute for coffee. Young pods are used as vegetable (Singh and Permnath, 1992).

Various workers have studied the composition of seeds and leaves of *C. obtusifolia*. Toxic components are anthraquinones and lactones. Anthraquinones have been identified by different workers from the leaves and seeds of this plant (Takido, 1958, 1960; Crawford *et al*., 1990; Guo *et al*., 1998; Harry-O-Kuru, 2005). Kitanaka and Takido (1981, 1986) isolated torasachsone and also determined structure of two new naphthalenic lactones, isotoraalactone and cassialactone.

Carbohydrate, protein, aminoacid and mineral contents of seeds and leaves of *C. obtusifolia* have been studied by different workers. (Crawford *et al*., 1990; Agbo *et al*., 2004; Vadivel and Janardhanum 2002, 2005; Harry-O-Kuru, 2005). Seeds are rich in carbohydrates and proteins. They also contain essential as well as non essential amino acids. Besides, seeds of *C. obtusifolia* are also rich in some important mineral elements such as calcium, potassium and sodium.

**Cassia uniflora** Mill (Syn* Cassia sericea* Sw. Prodr.) (Plate No. 2)

It is common on wastelands of Maharashtra and Karnataka. It is also known as takala in Maharashtra. It is an annual erect herb. Young parts pubescent, at length glabrescent. Leaves pinnate, leaflets opposite, 3-4 pairs with stalked gland between each pair, obovate-oblong, base cuneate, and apex rounded, apiculate. Flowers subsessile, 3-4 in axillary racemes, crowded upwards. Petals yellow, subequal.Pods subcompressed, thickened at both the sutures, beaked with persistent style and stigma. Seeds 7-10, subquadrangular, rhomboidal, smooth, dull brown.

In the present investigation some ecological and physiological aspects of *Cassia obtusifolia* (L) and *Cassia uniflora* (Mill.) have been studied. Ecological aspects include Association Index, Important Value Index, Biomass production, Seed output, Reproductive capacity and Calorific Value of these plants. The soil from the sites where species were luxuriantly growing has been analysed for EC, pH and organic matter. The physiological and biochemical aspects of the species have also been investigated, which include chlorophyll, soluble sugars, starch, proline, polyphenols and nitrogen contents. Since the species eventhough are legumes, do not show symbiotic nodules therefore nitrogen metabolism has also been studied. For this,
the levels of various nitrogenous compounds and enzymes of nitrogen metabolism in them have been studied. The antioxidant properties in the species have been examined. Allelopathic studies of these species have also been carried out. In this effect of leaf extract and root exudates from these plants on germination and seedling growth of jowar, wheat and soyabean and also *Parthenium hysterophorus* has been investigated.

For convenience and presentation the thesis has been divided into five different parts. Chapter-I gives a brief review of literature on the plant species investigated in the present investigation and allelopathy. This chapter also includes description of plants under study, particularly their economic importance and some ecophysiological aspects. The methodology given in details in chapter-II, ‘Material and Methods’. The results of the investigation are presented and discussed critically in the light of the recent and most relevant literature available, in chapter III, ‘Results and Discussion’. The significant findings of the present study are summarized in chapter-IV, ‘Summary and Conclusions’. The last part of the thesis ‘Bibliography’ includes the literature referred to in the form of research papers, research articles, reviews, books and information assessed on internet, which have been listed alphabetically and chronologically.