REVIEW OF LITERATURE

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Weeds are as old as agriculture itself. They form one of the most expensive component in modern farming. It is of scientific interest that man has done so little work to control this persistent problem. On the other hand he has allowed them to create problems by growing, spreading and disseminating their seeds freely.

Literature reveals that, the work regarding weed problem in the country and outside in last twenty years has progressed along following lines, (a) Weed floristics (b) Crop-weed competition (c) Allelopathic potential of weeds and crops (d) Medicinally important weeds (e) Weed ecology (f) Weed control (g) Weed management (h) Morphology and anatomy of weeds. (i)Search of selective weedicides (j) Development of transgenic weedicide resistant crops.

In India, weeds in general have remained neglected for many years, even though it's economy is based on agriculture. Early studies were mostly restricted in making survey of weeds and weed floristics. Much of the information has been gathered through the work entitled, Handbook of some South Indian Weeds Weed science (Thakur, 1984); (Tadulingum and Venkatnarayana, 1985); All about weed control (Subramanian *et al.* 1997); Manual of weed control (Joshi, 2001); Weed management principle and Pratices (Gupta, 2005).

Paradkar *et al.* (1992) and Paradkar *et al.* (1992) studied weeds in Kharif oilseed crops at Damoh district of Madhya Pradesh and Wheat fields at Satna and Rewa districts of Madhya Pradesh. Dass *et al.* (1992), Paradkar *et al.* (1993), Gutte *et al.* (1994) studied weed composition from fruits and vegetable fields. Das *et al.* worked out weed flora in vineyards (grapes) of Hisar. Paradkar *et al.* studied weed flora of winter vegetable of Satpura plateau region of Madhya Pradesh while Gutte *et al.* listed weeds in fields and plantations. Recently weed floristic composition in palm gardens in plains of Eastern Himalayan region of West Bengal is studied by Sit *et al.* (2007).

Paradkar *et al.* (1989) made survey of Kharif weeds in Rewa division of Madhya Pradesh. He reported 46 weeds from the crop fields of Rice, Maize, Sorghum and Pigeon peas. Singh *et al.* (1993) reported 123 weeds belonging to 42 families from Kapurthala and Jalandhar districts of Punjab. While Bhattacharyya (1995) reported 171 species belonging to 50 angiosperm families from Saurashtra region of Gujrat. Shoukat *et al.* (1995) described 165 angiospermic weeds from common crop

fields of Gurais valley, Kashmir. Seasonwise weeds were studied by Jain *et al.* (1997) from Research Farm of JNKVV, Jabalpur (M.P.). They reported 19 and 14 dominant weed species from Kharif and Rabi Season respectively. Rothe and Deshmukh (1997) described weeds of Kharif and Rabi fields from Akola District of Maharashtra. Weeds in cash crops were studied by Devi *et al.* (1993) and Malik *et al.* (1994). They listed weed flora in sugarcane fields of Palghat district and weed flora in gram and raya crops in Haryana States respectively.

Baruah and Sharma (1992), Barua and Gogoi(1993), Sandhu and Singh (1993), Tripathi *et al.* (1993), Khare *et al.* (2004), Phukan and Phukan (2008) described weeds from rice fields of Jalukhbari (Assam), Assam, Punjab, Eastern Uttar Pradesh, Banda District (U.P.) and Lakhimpur district (Assam) respectively.

Work regarding weed flora has been done outside India by workers like Hidalgo *et al.* (1990), Rico *et al.* (1991), Shafiq *et al.* (1992), Fraga *et al.* (1993), Parker (1993), Smith and Webb (1993), Sanchis *et al.* (1993), Schroeder *et al.* (1993), Bouhache *et al.* (1994), Halimie *et al.* (1994), Garcia *et al.* (1995), Memon *et al.* (2003), Abdullahi (2004), Erasmo *et al.* (2004), Firehun and Tamado (2006), Manandhar *et al.* (2007).

The information regarding Phytosociological studies of crop weeds has been accumulated through the work of Streibig (1979). He illustrated Numerical methods for study of Phytosociology of crops in relation to weed flora. Teresa and Kulkarni (1991) studied phytosociology of three species of *Polygala.*

In an agricultural ecosystem weeds mainly compete with crops for water, space, light and mineral nutrients. This competition between crop plants and weeds is thus a critical factor in growing useful plants. It is always evident in cultivated fields. Prolonged weed competitions, usually result drastic reduction in yield. Information about losses due to weeds has been gathered through the experimental work of many scientists. Crop weed competition in dicot crops, in India has been studied by workers like Nandal and Pandita (1990); Singh and Patel (1992); Ali (1993); Tripathi and Singh (1993); Das and Yaduraju (1995); Kumar *et al.* (1996); Bhadoria *et al.* (2000). Nandal and Pandita described crop weed competition in Brinjal. According to them, the critical period for weed competition in so far as it affected yields was the two months after transplanting. It would probably be economical to dispense with weeding forty days after transplanting. Singh and Patel worked on weed competition in groundnut under mid altitudes of Meghalaya. They concluded that the removal of

all weeds for upto 60 days after sowing reduces the total weed to 0.91 t /h and resulted in the greatest net returns of rupees 4482/hect. Ali determined the critical period of crop-weed competition in Chick-pea and *Brassica*. According to him it was found to be first eight weeks after sowing. Tripathi and Singh worked out crop weed competition in Fenugreek. According to them crop yield was reduced by 69 % due to weed competition during entire season and there was no significant advantage in increasing weed free period beyond 30 days. Das and Yaduraju worked out losses due to crop weed competition in 6 crops like Soybean, Groundnut, Mung, Cowpea, Pearlmillet and *Sorghum*. He gave comparative account under different conditions of weeds like no weeding, weeding once at 3 weeks after sowing and weed free conditions. They concluded that the reduction in yield due to uninhibited growth of weeds did not differ significantly amongst crops but hand weeding once reduces reduction in yield which range from 12.9 to 55 %, the lowest reduction being in Pearlmillet and highest in cowpeas. Kumar *et al.* and Bhadoria *et al.* studied crop weed competition in Clusterbean under rainfeed condition. Kumar *et al.* concluded that crop –weed competition did not have any significant adverse effect on plant height and yield attributes. While Bhadoria recommended that in order to obtain higher seed yield of Clusterbean, the crop should be kept free from weeds for first 30 days after sowing. Crop weed competition in cereals was studied in maize and wheat by workers like Bhaskar and Vyas (1988), Nayital *et al.* (1989), Barevadia *et al.* (1993), Tyagi *et al.* (1993), Vaishya *et al.* (1993).

Workers from other countries Cussans *et al.* (1994), Weber *et al.* (1995), Ghadiri and Bayat (2004) worked out effects of cultural practices on weed growth and weed competition.

In addition to competitive effects, weeds also exert allelopathic effects on crop plants. Experimental evidences are available to show that, a group of endogenous substances are exuded by root system of weeds. Which have inhibitary influence on crop plants. Allelopathic substances have been recognized in *Pluchea lanceolata* by Inderjit and Dakshini (1994), in *Chenopodium album* by Goel *et al.* (1994), in *Datura stramonium* by Oudhia *et al.* (1999), in *Lantana camera* by Ambika *et al.* (2003), In *Digera muricata* by Suseelamma and Venkataraju (1994). Other physiological work concern with weeds is done by Bansal (1993). He has discussed methods to increase allelopathic potential of crop plants. Prasad and Ojha (1993) studied effect of competition on Leaf Area Index in a crop weed community. Umarani and Selvaraj

(1996) worked out effect of weed and crop densities on seed quality of Soybean.

Physiological studies in *Parthenium* and succulents is done by Patil (1980) and Kardage(1981) respectively. Some work regarding C_3 and C_4 photosynthesis in weeds from other countries is done by Batanouny *et al.* (1991), Ivashchenko (1993), Li (1993), Qasem (1993), Hakansoon (1995), Ziska (2003) and Rowan *et al.* (2007). Milanova and Valkova (2004), studied weed seed viability under the water conditions.

Deokule (1991), Katiyar and Kolhe (2001), Sarada *et al.* (2004) described Phramacognostic and medicinal value of weeds. Deokule has given Phramacognostic study of leaf of *Crotolaria retusa.* Katiyar and Kolhe studied medicinal weeds of Raipur region in Chhatisgarh plains while Sarda *et al.* have mentioned growth and yield of medicinally valuable weed flora in oil palm plantations of Kerala.

Krishnamurthy (1993) made ecological weed survey in Karnataka. Saraswat (1993) studied major weeds of Indian agriculture – their distribution and ecology. Bhattacharyya and Pandya (1996) gave an account of ecological assessment on agroecosystem of Saurahtra with special reference to weeds. Gupta *et al.* (2003) described impact of soil variables on the weed diversity in major cereal crops of Doon valley. Laloo (2004) worked out ecological studies of the weed flora of different crop fields in high altitude and heavy–rainfall area of Meghalaya. He worked out ratio of weeds in various crop fields like Potato (Ratio 2.4:1); Maize (2.9:1); Rice (1:1.9), and concluded that seven weed species are common to all these crop fields. Ecological work outside the India is done by Holdynski (1991) and Fournet (1993). Holdynski studied Botanic and ecological characteristics of weed communities with *Echinochloa crusgalli* in Zulawy muds. Fournet worked on Phytoecological characteristics of weed populations in Sugarcane and Banana plantations in Basse Terre (Guadeloupe).

Bhattacharyya and Pandya (1996) while discussing distribution studies on Exotic weeds of Saurashtra (India) remarked that, the soil character and associated climatic conditions have a stronger influence on the distribution of certain exotic weeds. More work is in progress on exotic weeds outside India .It includes McConnell and Muniappan (1991), Australia National Parks And Wildlife Service (ANPWS) (1991), Stalter *et al.* (1992), Schippers *et al.* (1993), Williamson (1993), Northam and Callihan (1994), Mack (1995), Kawabata (2003), Ruijven *et al.* (2003). McConnell and Muniappan studied introduced ornamental plants that have become weeds on Guam. ANPWS worked on plant invasions the incidence of environmental

weeds in Australia. Stalter *et al.* listed Alien plants at orient Beach State Park, New York and a Comparision with five coastal sites. Schippers *et al.* have shown that What makes *Cyperus esculentus* (yellow nutsedge) an invasive species? Williamson worked on Invaders weeds and the risk from genetically manipulated organisms. Northam and Callihan studied on new weedy grasses associated with downy brome. Kawabata made study on Temperature and rhizome chain effect on sprouting of purple nutsedge (*Cyperus rotundus*) ecotypes. Ruijven *et al.* reported that, diversity reduces invisibility in experimental plant communities.

Study of morphotaxonomy of weeds is another important aspect of weed study. It is useful in weed identification and classification. Studies on the leaf anatomy of *Euphorbia*-I foliar venation and laticifers in *E. thymifolia* has been given by Paliwal and Kakkar (1971). Simmilarly Gupta (1992) worked out effect of growth regulators on foliar stomata of *Vicia faba.* Rao and Narmada (1994) studied leaf architecture in some Amaranthaceae.

Foreign contribution in this regard include Lowell and Lacansky (1986), Chirila *et al.* (1991), Chaisattapagun and Zhang (1992), Goertzen and Small (1993), Sellers *et al.* (2003), Procopio *et al.* (2003), Spehar (2003), Lowell and Lucansky studied vegetative anatomy and morphology of *Ipomoea hederifolia* (Convolulaceae). Chirila studied the anatomy of some weeds used as tinctorial plants like, *Coronilla varia* and *Erigeron annuus*, Chaisattapagon and Zhang reported Identifying effective criteria for weed detection using machine vision. Goertzen and Small explained the defensive role of trichomes in black medicko (*Medicago lupulina*). Sellers *et al.* gave an account of Comparitive growth of six *Amaranthus* species in Missouri. Procopio studied anatomy of leaves in weeds widely and largely occurring in Brazil. V-*Leonurus Sihiricus, Leonitis hepetaefolia, Plantago tomentosa* and *Sida gazlovii.* Spehar reported morphological differences between weed species like *Amaranthus cruentus.*

Cultivation practices and weeds in the fields are inversely proportional to each other. Some of the work regarding farm practices and field weeds and their control suggests drastic changes in the farm practices. Information about weed management have been gathered through the experimental work of Chaudhary (2000); Kathiresan (2000); Porwal (2000); Prakash *et al.* (2000); Sharma *et al.* (2000); Singh (2000); Sukhadia *et al.* (2000); Sumathi (2000); Veeramani (2000).

Weed control in dicots were studied by Chhokar (2002); Gill (2002); Sharma and Shrivastava (2002); Deshpande *et al.* (2006); Singh *et al.* (2006); Singh *et al.* (2006). Chhokar studied weed management in Rapeseed mustard and yield losses in it caused by weeds are found to be 23 to 70 % and weeds also decrease the oil content. Gill studied Integrated Weed Management in Fenugreek (*Trigonella foenum–graecum)* and concluded that, it is decreased in all weed control treatments. Sharma and Shrivastava surveyed weed control in Soybean (*Glycine max*). They remarked that, reduction in the yield due to weeds varies from 35 to 50 % depending on the type of weeds, their density and time of crop-weed competition. Deshpande *et al.*, studied integrated weed management in Rainfeed cotton (*Gossypium hirsutum*), Singh *et al.* worked on effect of biofertilizers, fertility level and weed management on weed growth and yield of late sown chickpea (*Cicer arientinum*). Effect of weed control and nutrient management on Soybean (*Glycine max*) productivity was studied by Singh *et al.*

In monocots weed control and management studies were gathered through the work of Bhowmik and Malay (2002); Bhattacharya *et al.* (2003), Sharma (2004), Zhang (2004), Tiwari *et al.* (2005), Lal *et al.* (2006), Dhyan and Misra (2007). Outside contribution in this regard is done by Rahman *et al.* (1990); Streibig *et al.* (1993); Derksen *et al.* (1994); Popay *et al.* (1994).