WEED SPECTRUM AND EFFECT OF CROP WEEED COMPETITION IN SOYBEAN [GLYCINE MAX (L.) MERRILL] - A REVIEW

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ABSTRACT
Dominant weeds of soybean in different locations of India have been compiled. Trianthema portulacastrum, Flaveria australasica, Amaranthus viridis, Cynodon dactylon, Dactyloctenium aegyptium, Echinochloa colonum and Cyperus rotundus were the major weed species found in soybean at Coimbatore, Tamil Nadu, India. Soybean yield was adversely affected by the weeds due to their competition for nutrients and moisture during early growth stages. Most of the reports indicate that critical period of crop - weed competition to be upto 45 days after sowing for soybean. Soybean yield reduction ranged from 10 to 86 per cent depending upon weed infestation.

WEED SPECTRUM IN SOYBEAN
At Dharwad in deep black cotton soil, Aman and Hosmani (1983) observed the presence of weeds viz., Dinebra retroflexa, Commelina benghalensis, Corchorus trilocularis and Sida spp. The dominant weeds in soybean were Achyranthus aspera, Desmodium diffusum, Solanum nigrum, Commelina benghalensis, Phyllanthus niruri, Cynotis axillaris and Dinebra retroflexa at Dharward (Shantha Veerabadraiah et al., 1984). Trivedi and Tiwari (1985) reported Cyperus rotundus co-dominated by Echinochloa colonum, Dactyloctenium aegyptium and Digitaria sanguinalis at Panchagar. Prabhakaran (1986) observed broad leaved weeds like Trianthema portulacastrum, Parthenium hysterophorus, Flaveira australasica and Amaranthus viridis, grasses like Cynodon dactylon, Dactyloctenium aegyptium and Panicum repens and sedges like Cyperus rotundus dominated in soybean at Coimbatore. Whereas, Tiwari et al. (1986) reported that major weed flora in soybean were Caesulia axillaris, Cyperus iria, Cyperus rotundus, Cynodon dactylon, Phyllanthus niruri, Echinochloa crusgalli, Eclipta alba, Corchorus olitorious and Solanum nigrum at Jabalpur in sandy loam soil. There in clay loam soil, Echinochloa colonum, Echinochloa crusgalli, Optisnamus burmani, Setaria glauca, Digitaria adscendense, Bracharia mutica, Bracharia repens, Setaria glauca and Saccharum spontaneum, four sedges (Cyperus spp.) and fourteen broad leaved weeds in soybean cultivated fields at Jabalpur.

Reddy et al. (1990) observed the dominance of Cyperus rotundas, Digitaria marginata, Eragrostis pilosa, Blainula acmella and Ageratum conyzoides in rainfed soybean at Bangalore. The dominant weeds observed in soybean were Galinsoga parviflora, Commelina benghalensis, Digitaria sanguinalis and Ageratum conyzoides at Hawalbash in sandy loam soil (Vedparkash et al., 1991). Singh et al. (1991) observed the following weeds viz., Celosia argentea, Ageratum conyzoides, Euphorbia hirta, Echinochloa colonum, Commelina benghalensis, Achyranthes aspera, Eclipta alba, Cynodon dactylon and Panicum spp. were predominant in Ambikapur in a sandy loam soil. Gogoi et al., (1991) recorded Cynodon dactylon, Ageratum conyzoides, Fimbristylis spp, Leersia hexaudra, Ludwigia prostrata, Spilanthes paniculata, Cyperus spp., Phyllanthus niruri and paspalum distinctum as major weeds at Jorhat, Assam in sandy loam soil. Trianthema portulastraum, Flaveira australasica, Amaranthus viridis, Cynodon dactylon, Dactyloctenium aegyptium, Echinochloa colonum and Cyperus rotundus were the major species found in soybean at Coimbatore (Sankaranarayanan, 1992; Venkatakrishnan et al., 1992; Anumugam, 1994; Veeramani, 1995).

CROP - WEEED COMPETITION
Prentice (1971) reported that weeds prim-
rily compete for nutrients, moisture and sunlight more in early stage compared to later stages. Burnside (1979) found that soybean yield losses from weed competition were proportional to the amount of water, nutrients and light used by the weeds at the expense of soybean.

Soybean yield was adversely affected by the weeds due to their competition for nutrients and moisture during early growth stages (Mishra et al., 1990). Thus in a short time or over a period, weeds compete with the crop plants and remove large amount of nutrients, light, moisture and also grab more space.

Light: Coble et al. (1983) observed that Ambrosia artemissifolia grew taller than soybean and that the weed canopy intercepted 24 per cent of the photosynthetically active radiation. Regnier et al. (1989) reported that interference of common cocklebur with soybean resulted primarily from shoot interference and competition for light and they were implicated as major causes for yield reduction. Begonia et al. (1991) found that soybean yield was affected due to decreased interception of light by the taller canopy of Abutilon theophrasi. Jain et al. (1992) observed more solar energy utilization by the crop manually weeded twice (413 K cal ha\(^{-1}\)) followed by fluchloralin (302 K cal ha\(^{-1}\)) and the lowest in weedy check (225 K cal ha\(^{-1}\)).

Moisture: Soil moisture condition greatly influenced the competitive, effect of weeds. Soil moisture content was increased due to the control of weeds which enhanced the soybean grain yield (Burnside, 1979). The irrigated and drought stressed common cocklebur reduced soybean yield by 27 and 12 per cent, respectively (Mortensen and Coble, 1989). The infestation of weeds, offered more competition for moisture with the soybean crop at all stages (Ulaganathan, 1990).

Nutrients: The maximum nutrient utilization by weeds was noticed under weedy check plots in soybean with 26, 3 and 71 kg ha\(^{-1}\) of N, P and K, respectively (AICRPWC, 1985). Jain et al. (1992) reported that N, P and K uptake by the weeds was more where sowing was done without killing the weeds (34, 9 and 13 kg NPK ha\(^{-1}\), respectively). Weeds compete more for nutrients than for water. Significantly higher N, P and K uptake (151, 32 and 79 kg ha\(^{-1}\), respectively) was observed in a weedy check treatment in soybean (Satishkumar et al., 1993). Increased nutrient removal by weeds was observed when the weeds were not removed during their early growth stages. Weeds could remove the nutrients to a level of 65, 34 and 87 kg NPK ha\(^{-1}\), respectively (Anumugam, 1994).

Critical period of crop-weed competition: A knowledge on critical crop-weed competition period is important to decide the timely weed management practices. The adverse effect of weeds on soybean is witnessed in the early growth stages. Sankaran and Balasubramanian (1980) observed that weed free period upto six weeks after sowing produced higher grain yield in soybean than unweeded crop. Muniappa et al. (1982) observed the inability of soybean to compete with weeds during the first sixty days of growth. Durigan et al. (1983) reported that critical period of crop-weed competition varied from 10-50 days after the emergence of weeds depending on season and soil types. For securing higher grain yield in soybean the field should be kept weed free upto four weeks after sowing (Patterson et al., 1983; Williams and Hayee, 1984). Weed free condition upto 50 DAS (Channabasappa and Nanjappa, 1990) and 15 to 45 DAS recorded higher grain yield in soybean (Prabhakar et al., 1992; Sankaranarayanan, 1992). However, Vedparkash et al. (1992) found that the soybean crop growth was more susceptible to weed infestation from initial stage to 30 days after sowing. Subsequently, Jaganathan et al., (1994) reported that keeping the soybean crop weed free till harvest recorded the highest yield of 1479 kg ha\(^{-1}\). The competition offered by weeds after 45 days of sowing did not significantly reduce the yield of soybean. Kempuchetty et al. (1994) also observed that a weed free period from 15 to 45 days after sowing was adequate for better crop growth, optimum nutrient uptake and more grain yield. Thus most of the reports showed that crop-weed competition period could be upto 45 DAS for soybean.

EFFECT OF CROP WEED COMPETITION IN SOYBEAN

Growth components: Berglund (1972) reported that plant height and dry matter were reduced in soybean due to wild mustard (Brassica
Infestation. The weed densities of *Datura strumaria*um ranging from 3 to 16 plants m\(^{-2}\) reduced the leaf area index and plant height of soybean (Hagood *et al*., 1981). Patterson *et al.* (1983) observed that weeds did not affect the plant height but reduced the leaf area index and dry matter production in soybean. Leguzaman *et al.* (1983) noted that unchecked weed population (*Cyperus rotundus*) in the arable profile significantly reduced the dry weight and plant height. Regnier *et al.* (1989) indicated that plant height, stem thickness and branches were affected by the weeds. In soybean the number of branches per plant was increased with increase in weed free period and reduced with increase in competition period (Ariga, 1991).

**Yield components**: Rathman and Miller (1981) reported that *Avena fatua* at a density of 12 plants m\(^{-2}\) reduced the number of pods and seeds per plant in soybean. Dry weight and pod number were reduced when volunteer maize clump grew closer to soybean (Beckett and Stoller, 1983). Aslam *et al.* (1989) stated that the critical period of competition between weeds and soybean crop was 10-30 days after emergence and during the period soybean in association with *Abutilon theophrasti* resulted in small and less productive soybean plants. Sankaranarayanan (1992) concluded that presence of weeds reduced the number of branches, pods and seeds per plant in soybean due to the prevalence of weeds.

**Effect on soybean yield**: Soybean yield reduction ranged from 10 to 86 per cent depending upon weed infestation (Williams and Hayes, 1984; Tiwari and Trivedi, 1985). The yield reduction in soybean varied depending on the incidence of weed species ranging from 5 per cent as in *Cassia obtusifolia*, 12 per cent in *Ambrasia artemisiifolia*, 15 per cent in *Chenopodium album* and 22 per cent in *Amaranthus retroflexus* when the density of individual weed species exceeded 16 plants per 10 m length (Shurtlef and Coble, 1985). Increase in weed competition period decreased the soybean grain yield significantly (Channabasappa and Nanjappa, 1990). Dheer Singh and Sharma (1990) reported that there was 53 per cent reduction in grain yield of soybean due to the presence of weeds. Presence of giant rag weed at a density of two plant m\(^{-2}\) reduced the soybean yield by 46 to 50 per cent as observed in two seasons (Jerry *et al*., 1991).

Sankaranarayanan (1992) observed that higher seed yield of soybean (1436 kg ha\(^{-1}\)) was recorded in weed free treatment, whereas unweeded plot produced only 597 kg ha\(^{-1}\). Arumugam (1994) reported that presence of weeds reduced the grain yield of soybean to the tune of 50.2 per cent than the weed free plots. Veeramani (1995) observed that there was 58.6 per cent yield reduction in soybean due to the prevalence of weeds.

**REFERENCES**

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