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# STUDY TO DETERMINE THE STATUS OF WEED DIVERSITY IN Bt AND NON-Bt COTTON CULTIVATED FIELDS IN SELECTED VILLAGES AROUND MADURAI, TAMIL NADU, INDIA

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### Abstract

Transgenic cotton cultivation is fast growing genetically modified technology in developing countries. As the concern for the raise of super weeds is looming over the advantageous of transgenic crop technology, preliminary studies was conducted to determine the any variation in weed diversity between Bt and non Bt cotton in growing agricultural land in 12 villages around Madurai, Tamil Nadu. Diversity of dicotyledonous weeds were recorded higher (30 species) in number than monocotyledonous (12 species) plants. Weed diversity did not show much variation between Bt and non BT cotton cultivating fields.

**Key words:** Bt cotton, Weed diversity and Weeds of cotton field.

### 1. Introduction

Weeds are the most universal of all crop pests, proliferating each year in every field around the world. Cotton is prone to weed invasion, since being a long duration crop, widely spaced and relatively slow growing during early growth stage (Vissoh *et al.*, 2004; Nalini *et al.*, 2015). Weed competition is most serious when the crop is young. The critical period of crop - weed competition is approximately equal to the first one third to one half of the life cycle of the crop (Obuo *et al.*, 1997; Doll, 2003; Cao *et al.*, 2007). Many workers reported that the type of weed, its density and duration of the population determine the

competitive damage to the cotton (Diarra *et al.*, 1985; Coble and Byrd, 1992; Fischer and Ramirez, 1993). Holm *et al.* (1977) reported that in USA over 100 species of 30 genera of annuals, grasses, sedges and broad leaved species were constitute as troublesome weeds in cotton field. Severe weed infestation or ineffective weed control can reduce cotton yield to an extent of 40 to 85 %. The successful cotton production depends on an integrated management strategies that recognizes and adapts to the unique characteristics of the crop (Rajendran and Jain, 2004) Impact of transgenic herbicide resistant crops on weeds was extensively studied by many workers (Bohan *et al.*, 2005; Singh *et al.*, 2014). They reported that after introduction of glyphosate resistant crops (HR), about 38 weed species around the world have developed resistance to glyphosate. Therefore, the so called super weed can proliferate more in the fields and affect the cultivated crops. The present investigation was intended to determine the impact of the Bt cotton cultivation

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on weed species diversity by comparing the weed status of non-Bt cotton field in the same geographical location.

## 2. Materials and Methods

To study the weed diversity in cotton growing field, following 12 villages were selected around Madurai.

Chellampatti Block			Thiurmangalam Taulk Thirumangalam Block		Peraiyur Taulk T.Kallupatti Block
Site 1	Chellampatti	Site 6	Sivarakottai	Site 10	Koovulapuram
Site 2	Vadakkampatti	Site 7	Pannergundu	Site 11	Chinnapoolanpatti
Site 3	Karumathur	Site 8	Urapanur	Site 12	Silaimalaipatti
Site 4	Sorraikkampatti	Site 9	Rayapalayam		
Site 5	Kovilankulam				

A survey was conducted at each site visiting Bt cotton and non-Bt cotton fields during cotton growing season. Plant specimens were collected in and around the cotton field and along the bunds of cotton growing field. The specimens were identified and brought to laboratory to prepare herbarium as per standard procedure. The occurrence of each weed species of a particular study area (Site 1 to Site 12) was recorded in the field itself. Data collected were pooled and presented in a tabular form.

## 3. Results and Discussion

In the present investigation, weed diversity of BG II cotton and conventional cotton cultivating land was represented by 42 species belonging to 36 genera of 15 taxonomic families (Table - 1 and 2). Among the villages selected, the highest number (35 species) of weeds was recorded in non-Bt cultivating land of Site VI and Site VII. In Site II and Site X of BG II and con-BT cotton growing fields showed minimum number (27) of weed diversity. Monocotyledons (grasses, sedges) were represented by 12 species which were found to be distributed almost uniformly and abundantly in all the study areas. Data collected in the present investigation clearly revealed that predominately found weeds in the study area are mostly monocotyledonous species like *Chloris*

*barbata* Sw., *Commelina benghalensis* L., *Cynodon dactylon* (L.) Pers, *Cyperus rotantus* L., *Dactyloctenium aegyptium* (L.) Willd, *Digitaria ciliaris* (Retz.) Koeler, *Echinocola crus-galli* (L.) Beauv, *Eleusine indica* (L.) Gaertn., *Eragrostis minor*, Host., *Panicum maximum* Jacq., *Panicum repens* L. and some dicotyledonous species like *Leucas aspera* (Willd) Link, *Polycorpaea corymbosa* (L.) and *Triumfetta rhomboidea* Jacq. The variation in weed species diversity in all the study sites was more due to the absence or presence of dicotyledonous species than monocotyledons. Studies conducted by earlier workers (Holm *et al.*, 1977; Doll, 2003; Nalini *et al.*, 2015) also revealed similar results that broadleaves dicotyledons diversity was higher than the monocotyledons. However, the relative density and abundance of grasses and sedges were always higher than monocotyledonous plants (Heard *et al.*, 2003; Bohan *et al.*, 2005). Weed distribution between BG II cotton growing field and non-Bt cotton cultivating land exhibited little variation. Further studies on seasonal variation and weed diversity under continuous cultivation of cotton may bring clear picture on impact of Bt cotton cultivation on weed diversity.



**Table - 1: List of weed species recorded in Bt cotton (BC) and Non-Bt cotton (NBC) cultivating fields of selected villages (Site I to Site VI) in Madurai district**

Binomial of weed species	Family	Site I		Site II		Site III		Site IV		Site V		Site VI	
		BC	NC	BC	NC	BC	NC	BC	NC	BC	NC	BC	NC
<i>Abutilon indicum</i> (L) Sweet.	Malvaceae	+	+	+	+	+	+	+	+	-	-	-	-
<i>Acalypha indica</i> L.	Euphorbiaceae	-	-	-	-	-	+	+	+	+	+		+
<i>Aerva lanata</i> , (L) Juss.	Amaranthaceae	+	+	+	+	+	+	-	-	+	+	+	+
<i>Amaranthus viridis</i> L.	Amaranthaceae	-	-	+	+	-	-	-	+	+	+	+	+
<i>Aristida</i> sps	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Boerhavia erecta</i> L.	Nyctaginaceae	-	-	-	+	+	-	+	-	+	+	+	+
<i>Calotropis procera</i> (Aiton) Dryand.	Asclepidaceae	+	-	-	-	+	+	-	-	-	-	+	-
<i>Cassia</i> sps.	Caesalpinaceae	-	-	-	-	-	-	+	+	+	+	-	-
<i>Chloris barbata</i> Sw.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cleome viscosa</i> L.	Capparidaceae	-	+	+	+	+	-	-	-	+	+	-	+
<i>Commelina benghalensis</i> L.	Commelinaceae	+	+	+	+	+	+	+	-	+	+	+	+
<i>Corchorus tridens</i> L.	Tiliaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cynodon dactylon</i> (L) Pers.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cyperus rotantus</i> L.	Cyperaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Dactyloctenium aegyptium</i> (L) Willd.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Digera arvensis</i> , Forssk.	Amaranthaceae	-	-	+	+	-	-	-	+	-	+	+	+
<i>Digitaria ciliaris</i> (Retz.)Koeler.	Poaceae	+	+	+	+	-	-	+	+	+	-	+	+
<i>Echinocola crus-galli</i> (L) Beauv.	Poaceae	+	+	+	+	+	-	+	+	+	+	+	+
<i>Eclipta alata</i> Melville	Asteraceae	-	-	+	+	-	-	-	-	+	+	-	-
<i>Eleusine indica</i> (L) Gaertn.	Poaceae	+	+	+	+	+	+	+	+	-	-	+	+
<i>Eragrostis minor</i> , Host.	Poaceae	+	+	-	-	+	+	+	+	+	+	+	+
<i>Euphorbia hirta</i> L.	Euphorbiaceae	+	+	+	-	+	+	+	+	-	-	-	+
<i>Euphorbia prostrata</i> Aiton.	Euphorbiaceae	-	+	+	+	+	+	-	-	+	+	-	-
<i>Evolvulus alsinoides</i> L.	Convolvulaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Evolvulus nummularius</i> L.	Convolvulaceae	-	-	-	-	-	-	+	+	-	+	+	+
<i>Hibiscus micranthus</i> L.f.	Malvaceae	+	+	-	-	+	+	+	+	-	-	-	-
<i>Indigofera arrecta</i> A.Rich.	Fabaceae	-	-	-	+	-	-	-	-	+	+	+	+
<i>Indigofera tinctoria</i> L.	Fabaceae	+	+	-	-	+	-	+	+	-	-	+	+
<i>Leucas aspera</i> (Willd) Link.	Lamiaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Mollugo nudicaulis</i> Lam.	Molluginaceae	+	+	-	-	+	+	-	-	-	-	+	+
<i>Panicum maximum</i> Jacq.	Poaceae	+	+	-	-	+	+	+	+	-	-	+	+
<i>Panicum repens</i> L.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Parthenium hysterophorus</i> L.	Asteraceae	+	+	-	-	-	+	+	+	-	-	-	-
<i>Polycorphaea corymbosa</i> (L) Lam.	Caryophyllaceae	+	+	+	+	-	-	+	+	-	+	+	+
<i>Portulaca oleracea</i> L.	Portulacaceae	+	+	-	+	+	+	+	+	+	+	+	+
<i>Sida acuta</i> Burm.f.	Malvaceae	+	+	-	+	+	+	-	+	+	+	+	+
<i>Sida ovata</i> Forssk.	Malvaceae	-	-	+	+	-	+	+	+	+	+	+	+
<i>Trianthema protulacastrum</i> L.	Aizoaceae	+	+	-	-	+	-	+	+	+	+	+	+
<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	+	-	+	+	-	-	+	-	+	-	+	+
<i>Waltheria indica</i> L.	Malvaceae	-	+	+	-	+	+	+	+	-	+	+	+
<i>Xanthium strumarium</i> L.	Asteraceae	-	-	+	-	-	+	+	-	-	-	-	+
Total Number of species present		29	30	27	27	29	28	31	31	28	30	32	35
Dicotyledons		17	18	17	17	18	18	19	19	18	21	20	23
Monocotyledons		12	12	10	10	11	10	12	12	10	9	12	12



**Table – 2: List of weed species recorded in Bt cotton (BC) and Non-Bt cotton(NBC) cultivating fields of selected villages ( Site VII to Site XII) in Madurai district**

Binomial of weed species	Family	SiteVII		Site VIII		Site IX		Site X		Site XI		Site XII	
		BC	NC	BC	NC	BC	NC	BC	NC	BC	NC	BC	NC
<i>Abutilon indicum</i> ((L) Sweet.	Malvaceae	+	+	-	+	-	-	+	+	-	-	+	+
<i>Acalypha indica</i> L.	Euphorbiaceae	+	+	-	-	+	+	-	-	-	+	-	+
<i>Aerva lanata</i> , (L) Juss.	Amaranthaceae	-	-	+	+	+	+	+	+	+	-	+	-
<i>Amaranthus viridis</i> L.	Amaranthaceae	-	-	+	+	-	-	+	-	-	+	+	+
<i>Aristida</i> sps	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	+	+	+	-	-	+	+	-	+	-	+	+
<i>Boerhavia erecta</i> L.	Nyctaginaceae	-	-	-	+	+	+	-	-	+	-	-	-
<i>Calotropis procera</i> ( Aiton) Dryand.	Asclepidaceae	+	-	-	+	+	-	-	-	+	+	+	+
<i>Cassia</i> sps.	Caesalpinaceae	-	+	+	+	-	-	+	-	-	+	+	+
<i>Chloris barbata</i> Sw.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cleome viscosa</i> L.	Capparidaceae	+	+	+	+	-	-	+	+	+	+	+	+
<i>Commelina benghalensis</i> L.	Commelinaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Corchorus tridens</i> L.	Tiliaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cynodon dactylon</i> (L) Pers.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cyperus rotantus</i> L.	Cyperaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Dactyloctenium aegyptium</i> (L) Willd.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Digera arvensis</i> , Forssk.	Amaranthaceae	-	+	+	+	-	-	+	+	-	-	+	+
<i>Digitaria ciliaris</i> ( Retz.)Koeler.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Echinocola crus-galli</i> (L) Beauv.	Poaceae	+	+	+	-	+	+	+	-	+	-	+	+
<i>Eclipta alata</i> carpa Melville	Asteraceae	+	+	-	+	-	-	+	+	-	+	-	-
<i>Eleusine indica</i> (L) Gaertn.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eragrostis minor</i> , Host.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Euphorbia hirta</i> L.	Euphorbiaceae	+	+	+	+	+	-	-	+	+	+	-	-
<i>Euphorbia prostrata</i> Aiton.	Euphorbiaceae	-	+	+	+	-	+	-	+	-	+	+	-
<i>Evolvulus alsinoides</i> L.	Convolvulaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Evolvulus nummularius</i> L.	Convolvulaceae	-	-	+	+	-	-	+	+	-	+	-	+
<i>Hibiscus micranthus</i> L.f.	Malvaceae	+	+	+	+	+	+	-	-	+	+	-	-
<i>Indigofera arrecta</i> A.Rich.	Fabaceae	-	-	+	+	-	-	-	+	+	+	-	-
<i>Indigofera tinctoria</i> L.	Fabaceae	+	+	-	-	+	+	-	-	+	+	+	-
<i>Leucas aspera</i> (Willd) Link.	Lamiaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Mollugo nudicaulis</i> Lam.	Molluginaceae	+	+	+	+	-	-	-	+	+	-	+	+
<i>Panicum maximum</i> Jacq.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Panicum repens</i> L.	Poaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Parthenium hysterophorus</i> L.	Asteraceae	+	+	-	-	+	-	-	+	-	+	-	-
<i>Polycorphaea corymbosa</i> (L) Lam.	Caryophyllaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Portulaca oleracea</i> L.	Portulacaceae	+	+	-	+	+	+	-	-	-	+	+	+
<i>Sida acuta</i> Burm.f.	Malvaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Sida ovata</i> Forssk.	Malvaceae	+	+	-	-	+	+	-	-	-	-	+	-
<i>Trianthema protulacastrum</i> L.	Aizoaceae	+	+	+	+	+	+	-	-	+	+	+	+
<i>Triumfetta rhomboidea</i> Jacq.	Malvaceae	+	+	+	+	+	+	+	+	+	+	+	+
<i>Waltheria indica</i> L.	Malvaceae	-	-	+	+	+	+	-	-	+	+	-	-
<i>Xanthium strumarium</i> L.	Asteraceae	+	-	-	-	+	+	-	-	-	-	+	+
Total Number of species present		33	34	32	35	29	30	27	27	30	33	32	31
Dicotyledons		21	22	20	24	17	18	15	16	18	22	20	19
Monocotyledons		12	12	12	11	12	12	12	11	12	11	12	12



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