

## Effect of maize based cropping systems on weed dynamics and crop productivity

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**ABSTRACT :** A field experiment was conducted during 2010 at experimental farm of AICRP on weed control to study the effect of cropping systems on weed dynamics and crop productivity. The experiment comprised of five different maize based cropping systems in main plot while two treatments *i.e.* weedy and RCP (recommended cultural practices) in sub plot. Significantly highest equivalent grain yield was recorded in the cropping system of maize-chickpea, which was found at par with maize-wheat and maize *Rabi* sorghum system and found significantly superior over rest of the treatments. As regards weed control treatments recommended practice of weed control recorded significantly highest grain yield (equivalent yield of the system) over the control *i.e.* weedy check.

**Key Words :** Maize based cropping systems, Weed dynamics

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The yield losses caused due to weeds within India are the extent of 37 per cent while insects and diseases account for approximately 22 per cent and 29 per cent, respectively. Today diversity in weed management programme must be integrated and balanced to avoid unsustainable dependence on only one or two tools for example the intensive, expensive and erratic application of herbicides leads to their accumulation in soils to a dangerous level that adversely affects both the quality and biological composition of soils (Srinivas *et al.*, 2008; Zahran, 1999). Such type of programme will includes different cultural, mechanical and agronomic practices including minimizing weed seed production and management of soil weed seed bank. In light of above, this experiment was conducted to study the effect of maize based cropping systems on weed dynamics and crop productivity.

### RESEARCH PROCEDURE

The experiment was conducted during *Kharif* and *Rabi* 2010 in split plot design with three replications. The main plot comprised of five different maize based cropping systems *viz.*, maize - wheat, maize - chickpea, maize - *Rabi* sorghum, maize-safflower and maize - pea while in subplots recommended practice *i.e.* 2HW, 1 H at 3 and 6 WAS weedy check treatments were included. The gross and net plot size were 4.5 x 4.5 m and 3.6 x 3.6 m, respectively during both seasons. The spacing

maintained during *Kharif* season for maize was 60x30 cm while during *Rabi* season it was 22.5cm for wheat and was 45 x 15 for chickpea, *Rabi* sorghum, safflower and pea. The recommended dose of NPK and plant protection schedule was followed during both the seasons for respective crops. During *Kharif* 2010 the maize crop was sown on 28.06.2010 and *Rabi* crops were sown on 26.10.2010.

### RESEARCH ANALYSIS AND REASONING

The 38 per cent grassy and 62 per cent broad leaved weeds were associated with maize crop during *Kharif* season of 2010. Among broad leaved weeds, dominant weed species were *Euphorbia geniculata*, *Ipomea maxima*, *Digera arvensis*, *Phyllanthus medraspentasis*, *Acalypha indica*, *Abutilon indicum*, *Merremia emerginata*, *Alternanthera sessilis* and *Parthenium hysterophorus*. The dominant grassy weeds were *Brachiaria eruciformis*, *Cynodon dactylon*, *Cyperus rotundus* and *Allotropsis cimicina*.

The dominant weed species observed in gram were *Euphorbia geniculata*, *Chenopodium album*, *Phyllanthus medraspentasis*, *Digera arvensis*, *Parthenium hysterophorus*, *Cyperus rotundus*, *Brachiaria eruciformis*.

Whereas in wheat dominant weed species observed were *Brachiaria eruciformis*, *Cynodon dactylon*, *Digera arvensis*, *Euphorbia geniculata*, *Parthenium hysterophorus*,

*Chrozophora rotleri*.

In safflower the dominant weed species recorded were *Brachiaria eruciformis*, *Commelina benghalensis*, *Cyperus rotundus*, *Euphorbia geniculata*, *Digera arvensis*, *Parthenium hysterophorus* etc.

In Rabi sorghum *Cynodon dactylon*, *Brachiaria eruciformis*, *Parthenium hysterophorus*, *Chrozophora rotleri* *Digera arvensis* were found as dominant weed species.

Whereas in pea the dominant weed species were *Brachiaria eruciformis*, *Cyprus rotundus*, *Commelena benghalensis*, *Euphorbia geniculata*, *Digera arvensis*, *Phyllanthus medra spentasis*, *Chrozophora rotleri* etc.

The data on grain yield, dry weed weight, weed index and weed control efficiency are given in Table 1.

**Dry weed weight :***Effect of cropping systems (Main treatments) :*

At 30 days dry weed weight of grassy weeds in maize cropping system was found lowest and it was found at par with maize –wheat cropping system and significantly superior over rest of the cropping systems. At 60 days the lowest grassy dry weed weight was also observed in maize–chickpea cropping system which was found at par with maize –wheat and maize - *Rabi* sorghum cropping system and significantly superior over rest of the treatments.

In case of dry matter of broad leaved weeds, at 30 days lowest dry matter of weeds was observed in maize-chickpea cropping system which was found at par with maize-wheat cropping system and significantly superior over rest of the

treatments. At 60 days also similar trend was observed .

*Effect of weed control treatments (Sub treatments) :*

Significantly lowest dry matter of grassy weeds at 30 days was observed in recommended practice for *Kharif* and *Rabi* crops over the weedy check. At 60 days the similar trend was observed.

The lowest dry matter of broad leaved weeds at 30 and 60 days was observed in recommended practice of weed control which was found significantly lower than the weedy check.

**Weed control efficiency :***Effect of cropping systems (Main treatments) :*

The maximum weed control efficiency of grassy weeds and broad leaved weeds at 30 and 60 days was observed in maize-chickpea cropping system it was followed by maize-wheat, maize-R.sorghum and maize-safflower cropping systems. Buhler (2002) pointed out crop rotation as one of the components in diverse weed management system.

*Effect of weed control treatments (Sub treatments):*

Maximum weed control efficiency of grassy weeds and broad leaved weeds at 30 and 60 days was observed in recommended practice.

**Grain yield :**

Unchecked weeds caused 66 per cent grain yield reduction in unweeded control over recommended practice of weed control whereas 11 per cent yield reduction was

**Table 1 : Grain yield, dry weed weight, weed index and weed control efficiency as influenced by different treatments**

Treatments	Grain yield kg/ha	Dry weed weight (g/m <sup>2</sup> )				Weed index (%)	Weed control efficiency(%)			
		Broadleaved		Grassy			Broadleaved		Grassy	
		30	60	30	60		30	60	30	60
<b>Main treatments (Cropping system )</b>										
M <sub>1</sub> . Maize – Wheat	7656	12.89	20.04	10.31	15.35	02	30	21	21	34
M <sub>2</sub> . Maize – Chickpea	7749	10.67	18.57	10.00	14.27	-	43	26	22	39
M <sub>3</sub> . Maize – Pea	6944	18.41	25.09	13.05	23.17	11	-	-	-	-
M <sub>4</sub> . Maize – Safflower	7395	13.43	23.83	10.36	21.75	05	27	05	21	08
M <sub>5</sub> . Maize – <i>Rabi</i> Sorghum	7552	13.19	20.67	11.61	18.80	03	28	18	11	25
S.E.±	111.32	0.84	0.87	0.48	1.12					
C.D. (P=0.05)	350.20	2.66	2.57	1.54	3.55					
<b>Sub treatments (WCT)</b>										
S <sub>1</sub> . Recommended Practice	8956	9.57	15.91	6.43	13.22	-	43	50	63	82
S <sub>2</sub> . Weedy check	3962	16.67	31.38	17.29	24.11	56	-	-	-	-
S.E.±	141.60	0.80	0.54	0.41	0.64					
C.D. (P=0.05)	445.40	2.24	1.70	1.30	2.01					
<b>Interaction</b>										
S.E.±	316.00	1.59	1.21	1.26	1.43					
C.D. (P=0.05)	NS	NS	NS	NS	NS					

NS=Non-significant

observed in maize-pea cropping system over maize-chickpea cropping system (Table 1).

*Effect of cropping systems (Main treatments):*

The effect of different cropping systems on their yields was significant. The cropping system of maize-chickpea recorded highest grain yield, it was at par with maize-wheat and maize- *Rabi* sorghum system and significantly superior over rest of the treatments.

*Effect of weed control treatments (Sub treatments) :*

Significantly highest grain yield of the system was observed in recommended practice of weed control than that of the weedy check (Table 1).

*Interaction effect :*

Interaction effect of cropping system and weed control treatment was found to be non significant.

**Conclusion :**

The grain yield of the various cropping systems was influenced significantly due to cropping systems. Significantly highest maize equivalent yield was recorded in the cropping system of maize-chickpea, which was followed by maize-wheat, maize *Rabi* sorghum and maize-safflower system. As regards weed control treatments recommended practice of weed control recorded significantly highest grain yield (equivalent yield of the system) over the control *i.e.* weedy check.

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