

Weed Flora in Mustard Field and Its Effect on Yield

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Mustard (*Brassica juncea* (L.) Czern and ex.Coss.) is a major *rabi* oilseed crop of India. It is second to groundnut (*Arachis hypogea* L.) both in area and production. About 50 % population in the states of Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, Punjab, Assam, Bihar, Gujarat and West Bengal meet their fat requirement with mustard oil. The oil content in mustard seeds varies from 37 to 40%. In Gujarat, Mustard is mostly cultivated under irrigated condition on different type of soil in northern parts and Saurashtra region and its area is about 2.94 lakh hectare with 3.343 lakh tonnes of total production with a productivity of 1137 kg/ha.

Weeds have been existing on the earth ever since man started cultivating plants around 10,000 B.C. but they are most underestimated crop pests in tropical agriculture although they cause higher reduction in the yields of the mustard (35%) than other pests and diseases. Therefore management of weeds is important for achieving higher yield of Indian mustard. Traditional method of weeding is the most common practice of weed control in mustard field but non availability and high wages of labour make it difficult and costly, so the use of herbicides is found effective and economic for controlling weeds in Indian mustard.

WEED

Weed suggests a useless, ugly or harmful plant that persists on growing where it is not wanted.’ -Muenscher (1962)

‘A useless, undesirable and often very unsightly plant of wild growth, usually found in land which has been cultivated or in areas developed by man for specific purposes other than cultivation.’-Thomas (1956)

‘Weed is a plant out of place and time or weeds are the plants growing where they are not wanted.’ -Kingman (1973)

Weeds as a menace...

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Dual mode of reproduction. Eg. *Cynodon dactylon* L.

Quick germination ability. Eg. *Cyperus rotundus* L.

Produce large no. of seeds. Eg. *Amaranthus viridis* L.


Rapid seedling growth and ability to reproduce when young. Eg. *Cirsium arvense* L.

Wide range of dispersal. Eg. *Tribulus terrestris* L.

Resist detrimental environmental factors Eg. *Cirsium arvense* L..

Seeds posses dormancy and so on. Eg. *Convolvulus arvensis*

Common weeds in mustard field

(A) Broad leaved weeds	
<p>1. Scientific Name: <i>Chenopodium album</i></p> <p>Local Name: Chill</p> <p>English Name: Lamb's quarter</p> <p>This weed is found in winter sown crops. It grows luxuriously in irrigated cultivated fields. This weed continues its vegetative growth upto December.</p>	



2. Scientific name : *Fumaria parviflora*

Common Name: Indian fumitory

Fumaria parviflora is a species of flowering plant known by the common names fineleaf fumitory and Indian fumitory. It is sometimes weedy. The small flowers are dull white with purple tips.

3. Scientific name : *Convolvulus arvensis*

Common Name: Chandanwel

English Name : Field bind weed

It is one of the beautiful weed of arable lands. It is reproduced by seeds and creeping roots which may be as deep as 6-9 m. Though it is an evergreen plant, in excessive drought conditions it undergoes dormancy.



4. Scientific Name: *Euphorbia hirta* L.

Local Name: Dudheli

English Name: Milk weed

It is a small ascending herb commonly found everywhere. The plant is covered with dense yellow crisp hairs and contains plenty of white juice in all parts of the body. It is propagated by seeds.






5. Scientific Name: *Digera arvensis* Forst

Local Name: Kanjaro

English Name: Amaranthus

It is an annual herb which is most common weed found in all kind of soils. It is propagated by seed

<p>6. Scientific Name: <i>Phyllanthus niruri</i> L.</p> <p>Local Name: Bhoi ambali</p> <p>English Name: Grape weed</p> <p>The plant is a glabrous, annual herb and often it attains a height of only a few inches. It is propagated by seed. It is short lived annuals and also known as 'Ephemerals'</p>	
	<p>7. Scientific name: <i>Tridax procumbens</i> L.</p> <p>Local name : Ekdandi</p> <p>This is an example of an introduced weed that has become naturalized in the presidency and it is now a part of the flora. It is a perennial herb.</p>
	<p>8. Scientific name : <i>Cirsium arvense</i> L.</p> <p>Common Name: kateli</p> <p>It is a perennial, dioceous herb with spiny beans. In India it is problematic in winter season crops in certain areas. Its roots may reach as much as 5 m deep.</p>

(B) Sedge weeds

1. Scientific Name: *Cyperus rotundus* L.

English Name: Purple nut sedge

Local Name: Chidho

Cyperus rotundus is one of the most difficult perennial weeds of the world. The chief mode of propagation of *Cyperus rotundus* is from seeds, which are 90-95 % viable. Its tuber are small and slow growing.



(C) Grassy weeds

1. Scientific Name: *Cynodon dactylon* L.

Local Name: Dharo

English Name: Bermuda grass

Cynodon dactylon is a perennial weed growing largely from rootstock and stolons. Although it produces seeds, yet these are not important in its dispersion. Bermuda grass rootstock from dense sod inside the soil and its stolon creep over the land.

Bermuda grass has become a serious menace in irrigated crop fields and plantations of tropical and subtropical areas as an escape from pasture lands where it is valuable forage plant.





2. Scientific Name: *Digitaria sanguinalis* Scop.

Local Name: Aarotaro

English Name: Crab grass

Digitaria sanguinalis is an annual grass. It is propagated by seeds and stem rooting at lower nodes. It is necessary to control before seedling stage.

3. Scientific Name: *Eragrostis pilosa* Beauv.

Local Name: Bhumasi

English Name: Indian love grass

This weed may be erect or variously decumbent. This weed may be known by variously with different name in different places.



(D) Parasitic weed



1. Scientific Name: *Orobanche ramosa* L.

Local Name : Vakumba

English Name : Broom rape

Broomrape is an annual, parasitic herb propagating by seeds. The host root exudates induce germination of broomrape seeds within soil. The broomrape seeds disseminate by wind, birds, and farm animals. They can remain dormant in soil for 2-12 years.

2. Scientific Name: *Cuscuta* spp.

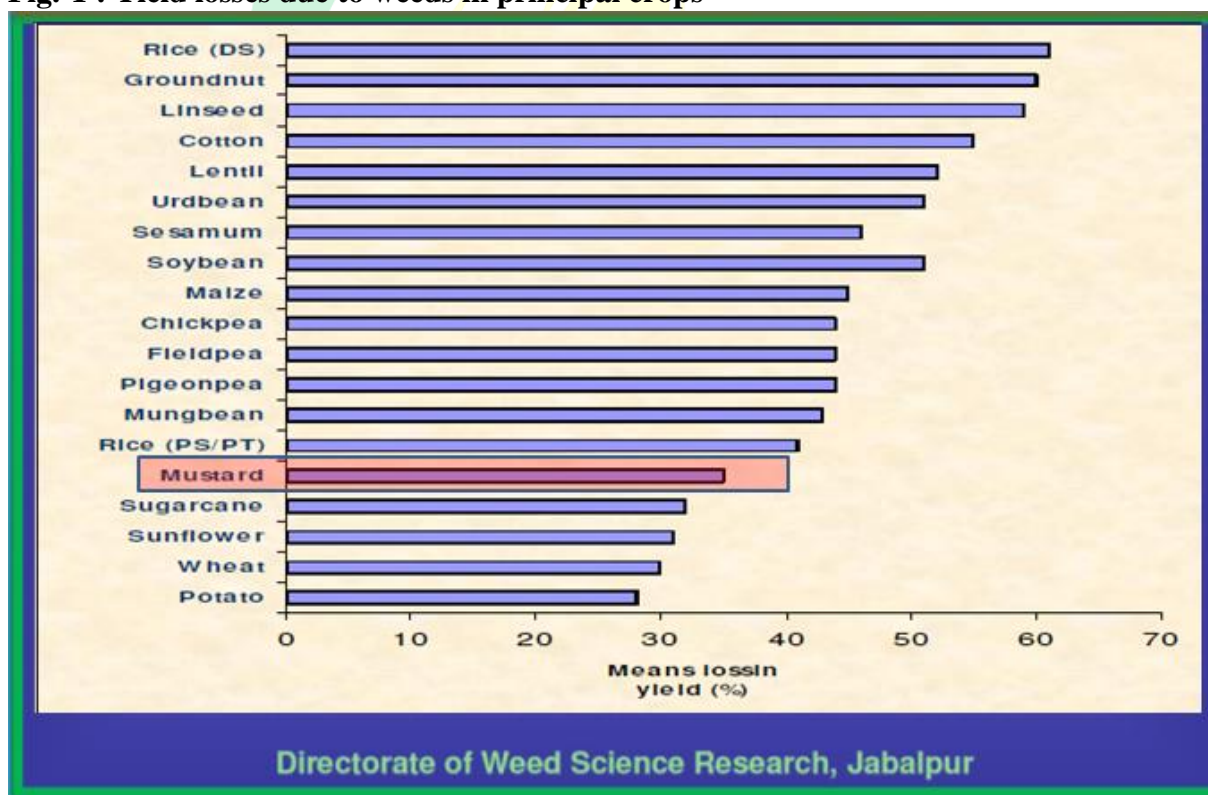
Local Name : Dodder, Amarwel

English Name : Cuscuta

Cuscuta is a complete parasite, twining, golden yellow, wiry stem and bell-shaped flower. Germination of dodder seed does not require any simulation from the host crop. They germinate readily in moist soil and produce wiry plumules.



Fig-1 : Yield losses due to weeds in principal crops



Weeds Lower The Quality Of Crops

- The seeds of *Argemona maxicana* are physically same as the seeds of mustard and degrade the quality of the mustard oil.

Weeds Interfere With Crop Harvest

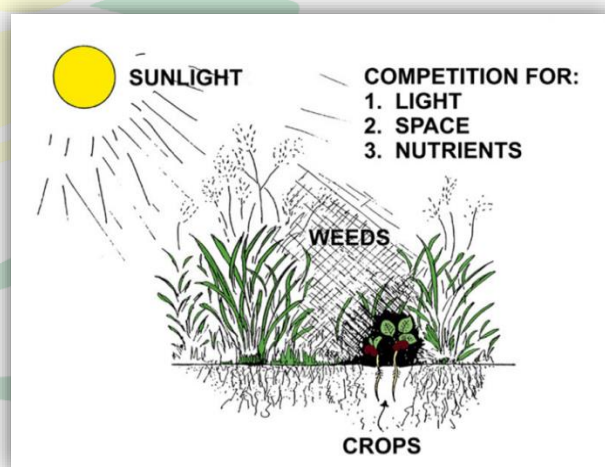
- Causes delays and greater harvest loss.
- Grain may need more drying if heavily infested by weeds.



WEEDS LOWER THE YIELD OF CROPS

Compete For Water, Nutrients, Light And Space.

- One wild mustard plant uses as much N & P as two oat plants
- One pigweed plant may use as much water as a corn plant



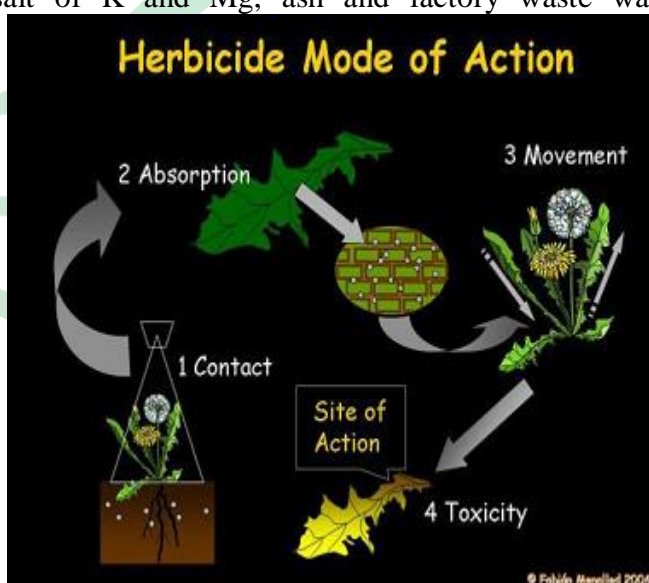


What is herbicide?

Herbicides are chemicals which are used to kill unwanted plants or weeds.

History of herbicide development

- ✓ Herbicides are the synthetic chemicals used to kill or suppress unwanted vegetation.
- ✓ In fact for the first time in 1880, herbicidal action of some compounds, for example, Common salt, other inorganic salt of K and Mg, ash and factory waste was highlighted.
- ✓ Herbicides have revolutionized the weed control methodology since 1940s, although the Concept of herbicide came long before 1940.
- ✓ The real breakthrough in selective chemical weed control was achieved in 1945 with announcement of simultaneous discovery of 2,4-D and MCPA in USA and England respectively after the second world war.



Crop-Weed Competition In Mustard

Table-1: Relative density of individual weed species in percent of total weed density at various growth stage of mustard under weedy condition.

Weed species	Day after sowing			
	30	60	90	At harvest
(A) Broad leaved weeds				
<i>Medicago denticulata</i> L.	27	25	25	23
<i>Anagallis arvensis</i> L.	19	20	21	22
<i>Fumaria parviflora</i> L.	14	15	15	13
<i>Lathyrus aphaca</i> L.	13	10	9	10
<i>Vicia sativa</i> L.	9	9	8	7
(B) Sedge weeds				
<i>Cyperus rotundus</i> L.	5	5	6	8
(C) Grassy weeds				
<i>Cynodon dactylon</i> L.	6	5	7	10
<i>Phalaris minor</i> L.	7	7	6	5
<i>Avena fatua</i> Retz.	2	3	2	2

Kachroo and Bazaya (2006)

Table-2: Effect of different weed species on seed yield of mustard.

Weed species	Weeds dry weight (g/m ²)	Weed index (%)	Seed yield (q/ha)
<i>Chenopodium album</i>	13.90	45.34	10.85
<i>Fumaria parviflora</i>	12.82	43.32	11.25
<i>Convolvulus arvensis</i>	11.89	40.60	11.79
<i>Melilotus indica</i>	12.78	35.26	12.85
<i>Anagallis arvensis</i>	8.90	27.30	14.43
<i>Euphorbia hirta</i> L.	7.21	5.34	18.79
<i>Cyperus rotundus</i> L.	7.24	6.04	18.65
<i>Cynodon dactylon</i>	8.21	13.35	17.20
Weed check	14.85	51.78	9.57
Weed free	0.71	0.00	19.85
CD (P=0.05)	0.72	-	1.21

Bisen and Singh (2008)

Table-3: Effect of weed crop competition on seed and stover yield of mustard

Treatments	Seed yield Kg ha ⁻¹	Stover yield Kg ha ⁻¹
Weedy check	1394	3785
Weed free	2781	5138
C. D. at 5%	255	601

Desai *et al.* (2016)**Table-4: Weed flora in mustard field**

Treatments	Broad leaved weeds (No./m ²)*			Grassy weeds (No./m ²)*			Sedge weeds (No./m ²)*			Parasite weed (No./m ²)*		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
Weedy check	15.77 (250.00)	12.58 (157.76)	9.62 (92.05)	5.37 (28.33)	5.15 (26.02)	3.93 (14.94)	5.61 (30.97)	5.64 (31.30)	3.38 (10.92)	0.00	4.14 (16.63)	3.43 (11.26)
Weed free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.00	0.71 (0.00)	0.71 (0.00)
SEm±	0.50	0.33	0.33	0.19	0.17	0.17	0.33	0.32	0.15	0.00	0.16	0.14
C. D. at 5%	1.53	0.99	1.02	0.59	0.52	0.51	1.00	0.98	0.46	0.00	0.50	0.42
C.V. %	12.18	9.97	13.03	12.14	11.91	15.46	15.61	16.01	11.41	0.00	13.58	13.82

Limitations of herbicides

1. It poses high risk towards adoption in crops particularly by illiterate farmer.
2. Higher dose of herbicide gave adverse effect on mustard germination.
3. Herbicide residue left in soil may cause soil and water pollution in the long run.

**Herbicide Resistance weed**

A number of weed species that were once susceptible and easily managed by certain herbicides have developed resistance. These weeds are no longer controlled by applications of previously effective herbicides.

As a result of repeatedly using a certain type of herbicide on the same land, many different species of weeds have developed resistance to these chemicals. It is believed that within any population of weeds, a few plants have sufficient tolerance to survive any herbicide that is used. Since only the survivors can produce seed, it is only a matter of time until the population of resistant weeds outnumbers the susceptible type. Certain precautions, such as tank-mixing, crop rotations and a combination of weed management techniques must be taken to prevent resistance.

Herbicide Characteristics That Influence Weed Resistance

- Herbicides with a single site of action
- Herbicides used multiple times during the growing season
- Herbicides with long residue period
- Herbicides used without other control strategies

What is herbicide resistant crop?

Inherited ability of a plant to survive and reproduce during exposure to a normal dose of herbicide without reduction of yield and quality.

The herbicide resistant GM crops are genetically engineered to withstand/ assimilate the herbicide without harming normal crop growth and yield; while herbicides spray on a standing crop to destroy weeds.

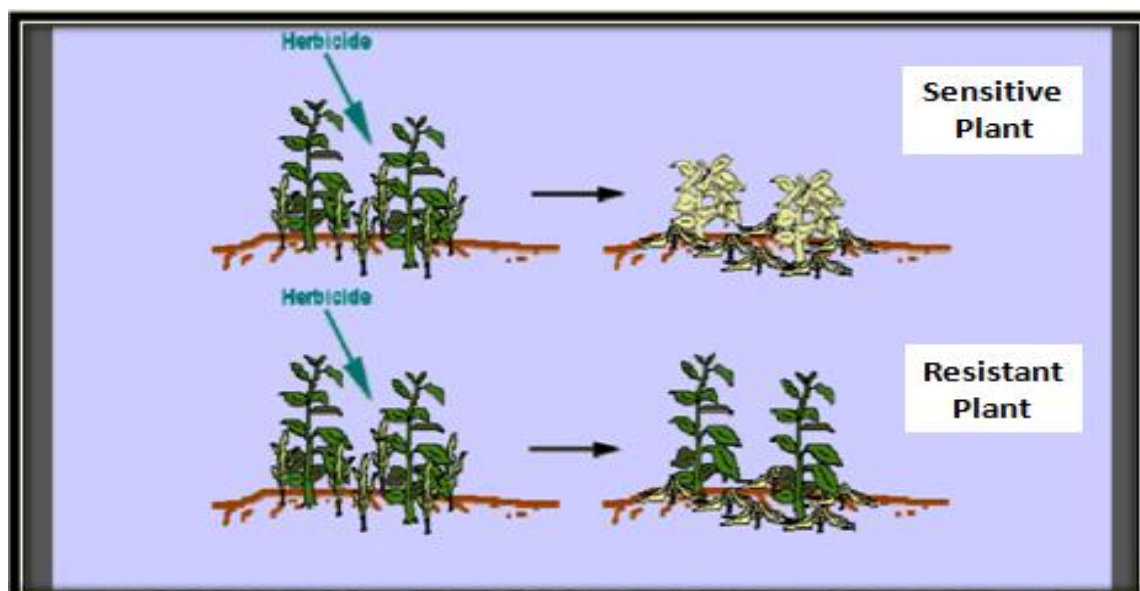
Why Herbicide Resistance in Crops?

- Selectivity of a herbicide is an important criteria.
- Non selective herbicides, when applied, kill all the plants in the field including crop plants.
- To transit nonselective herbicide into selective by.
- Maximum effect on weed
- Minimum effect on crop.

Benefits of HRCs

- New strategies and increased flexibility to manage problem weeds.
- Multiple use of herbicides will be prevented.

- Less use of prophylactic soil-applied herbicides.
- Use of more environmentally benign herbicides.



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