Topic: Weed Management (Part II)

JRF/ SRF Coaching Classes & Examination Series

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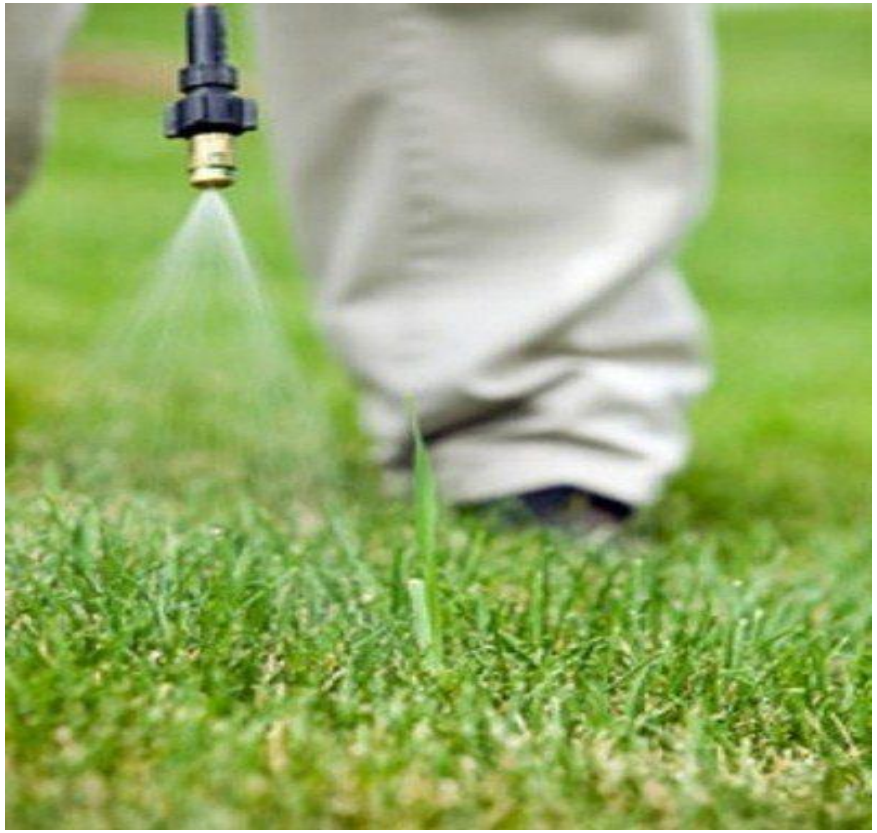
Chemical method of Weed Control



Herbicides

- Herbicide is derived from two **latin** words

  Herba = plant

  Caedere = to kill

- Chemicals that are capable of killing or inhibiting the growth of plants.
- Common salt**,** Sulphuric acid **,** Dilute H_2SO_4 at a conc. of 6-10%
- In 1908 , **Sodium arsenite and Chloropicrin** (tear gas) came into use as herbicides.

• In 1919 ,**Sodium chlorate** was first widely used as **soil sterilant** for controlling perennial weeds.
• First herbicide registered and used for selective control of weeds in crops was **2,4-D.**
• Pokorng synthesized 2,4-D in 1940.
• Zimmerman and Hichcock too synthesized 2, 4-D in 1942 and was more highlighted and taken as first time discovery of 2,4- D.

• Marthan Mitchell in 1942 & 1944:reported its herbicidal activity to selectively control the broad leaved weeds .

• Hammer and Turkey in 1944 observed that 2,4-D successively control weeds in cereals.

- Between 1945 & 1960's:

➢Photosynthesis inhibitor herbicides like urea, triazine, uracil group of herbicides, mitotic inhibitors and lipid synthesis inhibitors were developed.

➢Concept of pre emergence herbicide originated.

- In 1970's and 1980's , new group of herbicides called **Sulfonyl ureas** and **imidazolinones** were synthesized.

eg., butachlor and pyrazosulfuron ethyl is the popular herbicide used in rice.

- In market any approved herbicide is identified with 3 names

a) Common name: it is technically accepted short name. 2,4-D

b) Chemical name: describes chemistry of molecule.

(2,4-Dichlorophenoxy acetic acid).

c) Trade name: given by the manufacturer.

(Agromex, weedor)

CLASSIFICATION OF HERBICIDES

1) Base on time of application:

a) **Preplant incorporated**: Incorporated 1 or 2 days before sowing or planting of crops.

e.g., **Fluchloralin, trifluralin.**

b) **Pre-emergent herbicide**: They are applied directly to the soil prior to the emergence of weeds, applied 1 or 2 days after sowing .

e.g., **Pendimethalin, alachlor, atrazine, diuron, oxyflourfen, metalachlor, isoproturon, pyrazosulfuron ethyl.**

c)**Post emergent herbicides**: Applied after the emergence of weeds or on grownup weeds.

i) **Early post emergent**:When weeds are young i.e., 1 or 2 weeks after emergence of weeds.

e.g., 2,4-D, Fenoxoprop-p-ethyl, metamfop, cyhalofop-p-butyl.

ii. **Late post emergent**: Applied on foliage of fully grown weeds and they are non selective.

e.g., Glyphosate, paraquat, diquat.

2) Based on selectivity

a) Selective herbicides:

Herbicides which kill selectively target plants (weeds) in a mixed population of crops and weeds.

e.g., **Atrazine, butachlor, fenoxoprop-p-ethyl, metolachlor.**

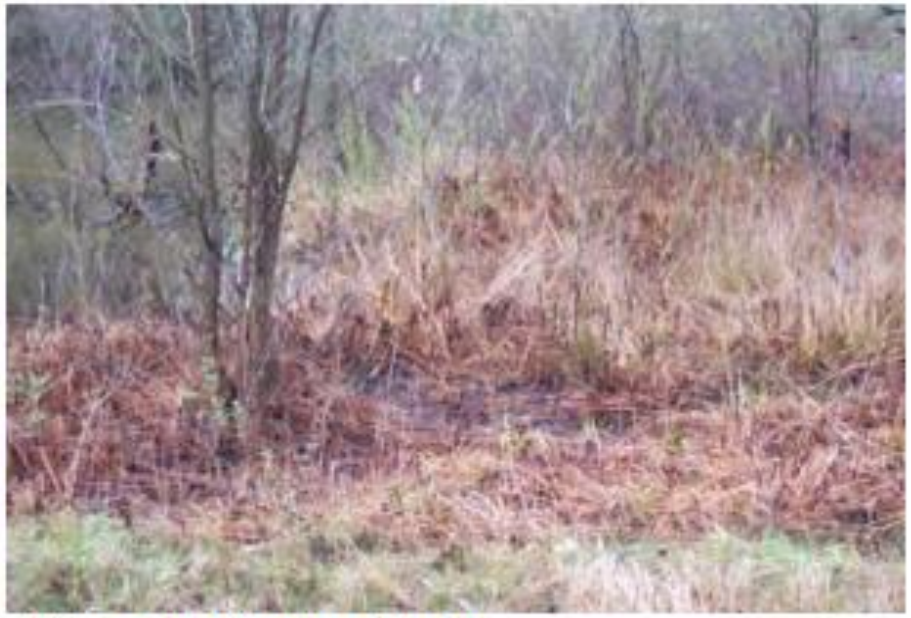
Pendimethalin is an excellent herbicide having selectivity to > 60 different crops which includes cereals, pulses, oilseeds.

b) Non selective herbicides:

- They kill any group or species of plants irrespective of crop and weeds.
- Used in non cropped areas

e.g., Glyphosate, paraquat, diquat

Selective herbicide 2,4-D in rice crop



Non-selective herbicide

3) Based on spectrum of weed control

a) **Narrow spectrum herbicides**: They control a particular group of weed flora.

e.g., 2,4-D is basically a broad leaved weed killer

Diclofop-methyl and fenoxoprop-p-ethyl are grass killers

b) **Broad spectrum herbicides:**

They control wider weed flora consisting of broad leaved weeds, grasses and sedges.

e.g., **Glyphosate, paraquat, diquat, atrazine, pendimethalin, isoproturon, oxyfluorfen etc.**

4) Based on site of application :

a) **Soil applied herbicides:** They kill germinating and sprouting weed seeds, rhizomes, tubers etc.

All pre-emergent herbicides are soil applied herbicides.

b) **Foliage applied herbicides**: They are applied on the canopy or the foliage of the weeds. All post-emergent herbicides are foliage applied herbicides .

e.g., paraquat, glyphosate, 2,4-D.

5) Based on mobility of herbicides :

a) **Contact herbicide**: Kills plants by coming in contact with the plant tissue rather than as a result of its translocation.

e.g., paraquat, diquat, Propanil(within a day).

b) **Translocated (systemic):** Herbicide moves within the plant from the point of treatment to its other parts.

e.g., Glyphosate (12-15 days for action).

Herbicides may exhibit both, contact and translocation activities.

e.g., Atrazine

6) Based on residue action in the soil

a) Residual herbicides:Remain in soil for a considerable period of time.

e.g., Atrazine, 2,4-D, pendimethalin

b) Non residual herbicides: They leave no or less residue in the soil and gets quickly in activated or metabolized within the soil.

e.g., Glyphosate, Paraquat, Diquat

7) Based on chemical structure

a) **Inorganic herbicides**: They were the first chemicals used for weed control.

Arsenic acid, sulphuric acid, Ammonium sulphate, borate, copper sulphate, sodium chlorate.

b) **Organic herbicides**: Most of the herbicides are organic.

Group	Herbicides
Aliphatic acids	Dalapon, TCA, Glyphosate, Methyl bromide Cacodylic acid ,MSMA,DSMA
Amides	Alchlor, Butachlor, Propachlor, Metalachlor, Diphenamide, Propanil
Benzoics	2,3,6, TBA, Dicamba, tricamba, Chloramben
By Pyridillums	Paraquat, Diquat
Carbamates	Propham, Chlorpropham, Barban, Dichlormate, Asulam
Thiocarbamates	Butylate, Diallate, EPTC, Molinate, Triallate, Benthiocarb, Metham
Dithiocarbamates	CDEC, Metham
Nitriles	Bromoxynil, Ioxynil, Dichlobenil
Dintroanilins	Fluchloralin, Trifluralin, Pendimethalin, Nitralin Isoproturon
Phenols	Dinoseb, DNOC,PCP
Phynoxy acids	2,4-D, 2,4,5-T, MCPA, MCPB, 2,4-DB, Dichlorprop
Traizines	Atrazine, Simazine, Metribuzine, Amytrin, Terbutrin
Ureas	Monuron, Diuron, Linuron, Metoxuron, Isoproturon, Methabenz thiozuron
Uracils	Bromacil, Terbacil, Lenacil
Diphenyl ethers	Nitrofen, Oxyfluorfen, Nitrofluorfen
Sulfonylureas	Bensulfuron, Chlorimuron, Metsulfuron, Sulfosulfuron Triasulfuron

i) Phenoxy acetic acid group of herbicides:

e.g., 2,4-D (Knock weed – 36% EC)

2,4,5-T (Brush killer -48% EC)

MCPB (Methyl Chloro Phenoxy Butyric acid)

MCPA (Methyl Chloro Phenoxy Acetic Acid)

- Old generation herbicides
- Hormonal type of herbicides at lower concentration.
- Used as pre emergent and early post emergent herbicide.
- 2,4-D is effective against broad leaved weeds.
- Pulse crops and dicotyledon crops are highly sensitive.

ii) Triazine group

e.g., Atrazine (Atratap – 50% WP)

Simazine (Gesatop – 50% WP)

- pre-emergent spray.
- These are widely used for selective weed control in maize,sorghum, bajra, sugarcane.
- They are photosynthesis inhibitors.
- They are highly persistent in soil.

iii) Bipyridillium group

e.g., Diquat (Reglone – 20% EC)

Paraquat (Gramaxone – 20% EC)

- They are non selective herbicides or total weed killers.
- Used in plantation crops and aquatic bodies.

iv) Pyrimidines (Uracil group)

e.g., Bromacil (Hyvar – 80% WP)

Terbacil (Sinbar – 80% WP)

v) Oxadiazone group

e.g., Oxadiazone (Ronstar-50% EC)

Oxadiazone is used for weed control in vegetables.

vi) Substituted urea group:

e.g., Diuron (Karmex – 80% WP)

Isoproturon (Arelan – 50% WP)

Linuron

Diuron is a very good herbicide for cotton.

vii)Sulphonyl urea group:

e.g., Metsulfuron methyl (Altagrip)

Bensulfuron methyl (Londax)

Metsulfuron-methyl (10%) + Chlorimuron-ethyl (10%) (Almix)

Pyrazosulfuron ethyl (sathi) - used in aerobic rice

- These are called as new generation herbicides.
- They are highly potent herbicides.
- They are applied at a very low dosage (g/ha).
- They are less persistent in the soil.
- They are broad spectrum in nature

viii) Nitroanilines group (Dinitroanilines):

e.g., Fluchloralin (Basalin – 48% EC)

Pendimethalin (Stomp – 30% EC)

Trifluralin (Treflan – 48% EC)

- Susceptible to photo decomposition - (Fluchloralin).
- Pendimethalin is used in cereals, vegetables, pulses, oilseeds and has selectivity for many crops

ix) Nitrophenyl ethers:

e.g., Nitrofen (Tok E 25- 25% EC) – used in groundnut

Oxyfluorfen (Goal - 23.5% EC)

Oxyfuorfen is the best herbicide for onion.

x) Carbamates:

e.g., Propham

Chloropropham

xi) Thiocarbamates

e.g., EPTC (Eptam- 75% EC)

Benthiocarb

xii) Anilides / Amides:

e.g., Alachlor (Lasso- 48% EC)- for pulse crops good selectivity.

Butachlor (Machete – 50% EC) – for rice.

Metolachlor (Dual – 50% EC)

Propanil

Pretilachlor (Sofit/Refit)- Used in rice(Sofit is without surfactant and refit is with surfactant)

xiii) Organo phosphorus compounds:

Glyphosate (Roundup – 41% EC)By Monsanto .

Anilophos (Aniloguard – 30% EC) – used in rice.

8) Based on mode of action

a) Cell division inhibitors:

i) **Microtubule assembly inhibitors**: Herbicides binds to the tubulin in the cytoplasm and further growth of microtubule ceases.

e.g., Dinitroanilines (Pendimethalin, fluchloralin, trifluralin)

ii) **Mitosis inhibitors**: Herbicides block the mitosis in primary meristems.

e.g., Carbamates, thiocarbamates

b) **Photosynthesis inhibitors**: Herbicides block electron transport in photo system II.

e.g., Triazines, uracils, urea group,

Bipyridillium group (Diquat and paraquat)

c) Aminoacid/ protein synthesis inhibitors:

1) Blocking or inhibiting EPSP synthase enzyme :

- 5-Enol Pyruvyl Shikimate 3-Phosphate Synthase enzyme is involved in biosynthesis of 3 aromatic aminoacids such as phenyl alanine, tryptophane and tyrosine.
- Glyphosate blocks or inhibits the action of EPSP synthase enzyme.

2) ALS synthase enzyme inhibitors:

- Aceto lactate synthase enzyme – biosynthesis of leucine, isoleucine and valine.
- Sulfonyl urea group- chlorosulfuron, Bensulfuron methyl, chlorimuron ethyl, metsulfuron methyl and imidazolinones (imazethapyr) inhibit the action of ALS synthase enzyme.

3) Glutamine synthesis inhibitors: Glutamine synthetase enzyme is involved in glutamine synthesis.

- Glufosinate inhibits glutamine synthesis

d) Lipid biosynthesis inhibitors:

Acetyl Coenzyme A carboxylase is involved in the biosynthesis of fatty acids.

e.g., Clodinafop-propargyl, Diclofop-methyl, fenoxoprop – pethyl.

These herbicides are grass killers and have good selectivity for dicotyledonous plants.

HERBICIDE FORMULATIONS

Emulsifiable concentrate (EC).
Water soluble concentrate(SC).
Wettable powders (WP).
Dry flowables (DF).
Flowable liquid (FL).
Granules (G).

- An herbicide formulation is prepared by the manufacturer by blending **the toxicant (=active ingredient)** with substances like **solvents, invert carriers, surfactants, antifoaming agents, stickers, stabilizers.**
- Active ingredient is a pure and concentrated form of toxicant present in the formulated product which is responsible for herbicidal activity.
- e.g., 50% EC, 25% WP.

There are two groups of herbicide formulations :

1) **Formulations applied after their dilution with water**

a) Emulsifiable concentrates (EC):The EC formulations form an emulsion when added to water before spraying. It appears like milky white.

e.g., Pendimethalin, fluchloralin, alachlor, paraquat.

b) Wettable powders (WP):It is a finely milled powder which forms a suspension on mixing with water.

e.g., Triazine group(atrazine, simazine), phenyl ureas .

EC and wettable powders are the two most popular formulations present in market.

c) Soluble liquids(SL) :Formulations are in the form of soluble liquids.

e.g., Amine salts of 2,4-D, 2,4 5- T, diquat, paraqut.

d) Soluble powders (SP): When mixed with water, these dry formulations dissolve readily and form a true solution.

e) Water dispersible granules (WDG) or dry flowables (DF) :

They are like wettable powders except that the active ingredient is formulated on a large particle (granule) instead of into a ground powder.

2) Formulations applied as such

Granules (G): Size varies from 0.04 – 1.0 mm.

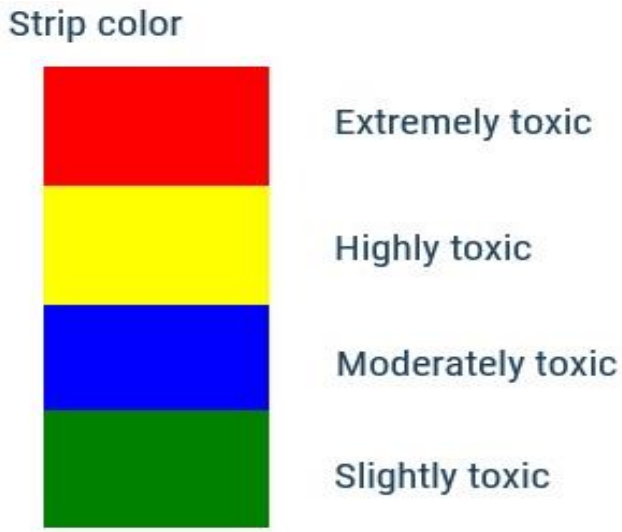
If size of granules is < 0.04 mm drift problem will be there.

e.g., Butachlor (machete – 5% G)-used in wetland paddy

Advantages:ease of application, less labour and time.

Disadvantage : low analysis compounds,require more soil moisture to activate them than the spray liquids.

Degree of toxicity – indicating colour



Quantity of commercial formulation required =Recommended dosage of a.i of that particular herbicide
Active ingredient

HERBICIDE SELECTIVITY

Selectivity refers to the phenomenon wherein the herbicide kills the target plant species in a mixed plant population without harming or slightly affecting the other plants.

Why herbicides are selective?

1) Differential absorption of herbicide.
2) Differential translocation of herbicides
3) Differential rate of deactivation of herbicide by the plants.
5) Chronolgical selectivity

HERBICIDE RESISTANT WEEDS

Long term continuous use of a single herbicide with similar mode of action may result in weed resistance to herbicides apart from shift in weed flora.

- The first report of weed resistant:

Senecio vulgaris- resistant to triazine herbicide

Pesticide	World	USA	India
Herbicides	43%	55%	12%
Insecticides	33%	32%	77%
Fungicides	17%	7%	8%
Others	7%	6%	3%

- In India ,*Phalaris minor* (canary grass)

developed resistance to isoproturon during 1992-93.

1) Atrazine resistant weeds:

Senecio vulgaris ,Chenopdium album

2) Paraquat resistant weeds:

Solanum nigrum, Bidens pilosa, Eleusine indica

3) Isoproturon resistant weeds:

Phalaris minor, Convolvulus arvensis

4) 2,4-D

*Daucus carota (*wild carrot*) ,Commelina diffusa*

5) Glyphosate

Lolium rigidum ,Eleusine indica ,

Ambrosia artemisiifolia (rag weed)

TYPES OF RESISTANCE:

1) Simple resistance: simply the resistance of a weed species due to continuous exposure to a particular herbicide.

2) Cross resistance: A weed species already resistant to a herbicide shows resistance to another herbicide of the same herbicide class.

e.g., Phalaris minor develop resistance to isoproturon in course of time gained cross resistance to diclofop-methyl, fenoxaprop-pethyl.

3) **Multiple resistance**: A resistance through which a weed species shows resistance to herbicides of different classes or families with having different modes of action.

Lolium rigidum resistant to various groups of herbicides first reported in Australia.

MANAGEMENT OF HERBICIDE RESISTANCE

- Change in the cropping season i.e avoid monocropping and go for crop rotation.
- Abandonment of the herbicide to which the weeds are showing resistance.
- Evaluate alternate herbicides .
- Herbicide mixtures use.
- Herbicide rotation .
- Adoption of integrated weed management practices.

HERBICIDE RESISTANT CROPS (HRC's)

- HRC's are genetically modified crops to which resistance to certain non selective herbicides such as glyphosate, glufosinate, bromoxynil etc. has been conferred through biotechnological tools.
- HRC's were commercially introduced first in Canada through Atrazine resistant canola variety.
- HRC's are available in rice, tobacco, tomato, potato.
- Breeding new HRC's is more economical than developing a new selective herbicide.

PERSISTENCE OF HERBICIDES

- The length of time that a herbicide remains active in the soil after its initial application is called as persistence.
- For effective weed control herbicides must remain in active but at the same time longer period of persistence pose residual problem in the soil.

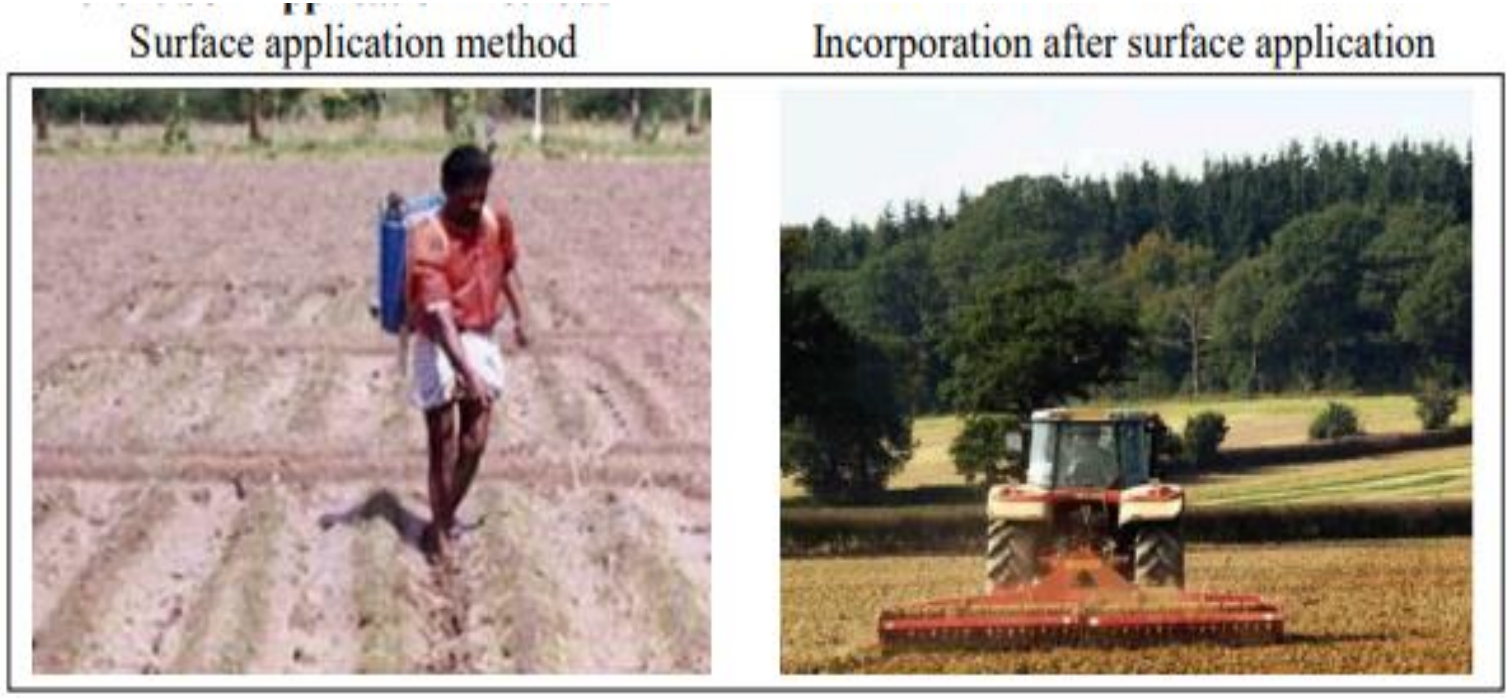
Herbicides	Time of persistence
Phenoxyacid group: 2,4-D Fluazifop-p-butyl Fenoxaprop-p-ethyl Diclofop-methyl	Upto 1 month
Metsulfuron methyl Metolachlor Linuron Prometryne Bromoxynil	1-3 months
Atrazine Simazine Metribuzine Chlorimuron ethyl Alachlor Pendimethalin Oxyfuorfen Oxadiazone Acetachlor	3-12 months
Chlorosulfuron Picloram Bromacil Terbacil	More than 12 months

Methods of application of herbicides

Soil-Active Herbicide: It eliminates early weed-crop competition for the period of 4 to 8 weeks.

Eg Simazine, alachlor, trifluralin, and EPTC

Different Soil Application methods:



Sub-Surface Layering: about 7-10 cm below the soil surface.

Band Application: Application to a restricted band along the crop rows, leaving an untreated band in the inter-rows.

Soil Fumigation: Depending upon the nature of the soil fumigant, it can be applied either

(1) by soil injection (chloropicrin)

(2) by releasing it under sealed, plastic covers (methyl bromide)

(3) by direct soil surface application (Metham).

Soil fumigation under sealed plastic covers

Herbigation: Application of herbicides with irrigation water both by surface and sprinkler systems.

e.g., fluchloralin for chillies and tomato.

Methods of Application of Foliage-Active Herbicides

A Foliage-active herbicide is applied to weeds after their emergence from the soil.

Eg 2,4,5-T, paraquat, diquat, MCPB, amitrole.

Blanket Application: Blanket (or over-the-top) it is uniform application of herbicides to standing crops with disregard to the location of the crop plants.

Only highly selective herbicides are applied by this method.

e.g. 2,4-D in wheat, rice . MCPB in pea, 2,4-DB in Lucerne.

- Directed Spraying: Orchards and plantations
- Spot treatment: noxious, perennial weeds
- Direct Contact Application: wiping, rubbing, and smearing of herbicide onto the target plant surfaces.

Herbicide glove


Tree injector


Basal bark treatment

- For majority of the herbicides, spraying is the most common method.

Sprayer type	Capacity
Low volume sprayer	150-200 litres/ha
Medium volume sprayer	250-300 litres/ha
High volume sprayer	500-750 litres/ha
Ultra low volume sprayer	5 litres/ha

- Nozzle breaks spray solution into very fine droplets.
- Most suitable type of nozzle is flooding jet, reason is uniform application of herbicide is possible.
- In flooding jet different types of nozzles are nozzle no.24, 40, 60, 78
- With increase in nozzle number, droplet size increases.

HERBICIDE MIXTURES

- Mechanical and chemical mixing of two or more herbicides having different mode of action and varying level of activity and selectivity.
- Herbicides having similar spectrum of weed control should not be opted for mixing.

1) Factory mix/premix/readymix

Almix (Metsulfuron methyl + chlorimuron ethyl) – used in rice.

Pursuit plus (Pendimethalin + Imazethapyr)

Aniloguard plus (Anilophos + 2,4-D)

Isoguard plus (Isoproturon + 2,4-D)

2) Tank mix/ field mix herbicide mixtures: mechanical mixing of two or more herbicides

e.g., Atrazine + Alachlor

FATE OF HERBICIDE IN SOIL

1) **Physical processes**: These processes take the herbicide away from the root zone of the plant by Adsorption, Leaching, Runoff or by Volatilization.
2) **Decomposition processes:**

a) Microbial decomposition: major mode of herbicide decomposition .

b) Chemical decomposition: less common mode.

c) Photodecomposition: photochemical reaction results in deactivation.

BIOHERBICIDES/MYCOHERBICIDES

Bioherbicides are the native pathogenic (fungal spores) inoculums sprayed on the target weeds to control.

Product	Content	Weed controlled
De-Vine	A liquid suspension of fungal spores of *Phytophthora palmivora* It causes root rot in the weed.	Strangler-vine. (*Morrentia odorata*) in citrus orchards.
Collego	Wettable powder containing fungal spores of *Colletotrichum gloesporiodes* Sub sp. a*eschynomone*	Jointvetch *(Aeschynomone sp)*. In rice fields. The bioherbicide causes stem and leaf blight in the weed.
Bipolaris	A suspension of fungal spores of *Bipolaris sorghicola.*	Johnsongrass (*Sorghum halepense*)
Biolophos	A microbial toxin produced as fermentation product of *Streptomyces hygroscopicus*.	Non-specific, general vegetation.
Luboa-2	Colletotrichum gloesporiodes spp.Cuscuta	Cuscuta

Weed Management In RICE

Chemical	Time	Dose	Control
Butachlor	4 to 6 DAT	1 -2 kg/ha	G+S+B
Pyrazosulfuron	4 to 6 DAT	10 – 40 gm/ha	G+S+B
Acetachlor	4 to 6 DAT	0.1- 0.2 kg/ha	G+S+B
Benthiocarb	4 to 6 DAT	1 -2 kg/ha	G+S+B
Pretilachler +safener	4 to 6 D.A.T	0.5 to 1 kg/ha	G+S+B
Anilophos	4 to 6 DAT	0.5 to 1 kg/ha	G+S+B
Bispyribac-sodium	20 DAT	0.02 kg/ha	G+S+B
2,4-D	25 DAT	0.5 -1 kg/ha	B
Fenoxaprop-P-ethyl	20 DAT	0.075 – 0.1 kg/ha	G

Weed Management In Wheat

Name of chemical	Rate kg a.i/ha	Time of spraying	Name of weeds to be controlled
2,4-D	0.40	5 weeks after sowing (3-5 leaf stage)	*Chenopodium* sp., *Anagallis* sp. , *Melilotus* sp. , etc.
Triallate (Avadex)	1.00	Pre-plant mixing to top 2-3 cm soil	*Phalaris* sp. , *Avena* sp.
Nitrofen (TOK E-25)	1.5	Pre – emergence or post - emergence 10 days after 1st irrigation	-do------
Asulam	1.5	Post- emergence 25 DAS	-do----
Isoproturon	1.0	--do-----	-do----
Metoxuron	**1.5**	**-----do-----**	**----do----**

Weed Management In Maize

Pre plant incorporated	Pre emergence	Post emergence
1.**Trifluralin** 0.8-1.20 kg/ha, 2.**Butylate** 4.0-6.0 kg/ha 3.**EPTC** 2.0-4.0 kg/ha provide season long control of nut grass and many annual weeds. 4. **Fluchloralin** 0.9-1.0 kg/ha	1. **Atrazine** & 2. **Simazine** 1-2 kg/ha to control grasses and broad leaved weeds effectively. **Atrazine** can be applied at any stage of crop that is pre (or) post emergence. 3.**Alachlor** and 4.**Metolochlor** 1-2 kg/ha as pre-emergence are effective against annual grasses but are weak on broad-leaves. 5.**Pendimethalin** 1-1.5 kg/ha	**1.2,4-D or** **2.MCPA** (0.25- 0.5 kg/ha) used as directed spray between 8 and 25 cm whorl height stage of crop to control the broad leaved weeds. 3. **Metsulfuron** – methyl 0.30-0.50 kg/ha 4. **Tembotrione** 125-150 g ha^{-1} with surfactant (20 DAS) or without (30 DAS) surfactant Stefesmero) (Rana et al 2017)

Weed Management In Sorghum

Herbicides	Dose (kg/ha)	Time of Application	Weed Controlled	Remarks
Atrazine	0.75-1.00	Pre/Post Emergence	Broad spectum control/Some Grasses tolerant	For sole crop
Pendimethalin	0.75-1.00	Pre-Emergence	Grasses	For Intercropping
Alachlor	1.5-2.0	Pre-Emergence	Grasses	.....do.....
Metolachlor	1.0-1.5	Pre-Emergence	Grasses	.....do.....
2,4-D	0.50-0.75	Post-Emergence	BLW	For sole crop. Apply 4-6 weeks after planting
Atrazine + Pendimethalin	0.75+0.75	Pre-Emergence	Broad spectrum weed control	For sole crop
Atrazine+ Alachlor	0.75+0.75	Pre-Emergence	.....do.....	.....do.....
Atrazine + Metolachlor	0.75+0.50	Pre-Emergence	.....do.....	.....do.....

Striga control:

1. Crop rotation with legumes or other trap crops like Cotton, sunflower, groundnut .

2. Catch crops are maize and millets to reduce seed bank in the soil.

3. Pre-emergence application of fenac @ 1.0 -1.5 kg ai/ha against striga control

4. Post emergence application of 2,4-D @ 1.0 kg ai/ha as at 5th week after sowing is more effective..

Weed Management In Groundnut

1. Below 40 days 1-2 hand weedings followed by intercultivation for bunch type of groundnut .
2. Pre plant incorporation of fluchloralin @ 1-2 kg/ha to control broad leave weeds.
3. Pre-emergence application of Pendimethalin (2 kg/ha) or metolochlor (0.75-1.0kg/ha) or nitrofen (2-4 kg/ha).
4. Post-emergence application of Fluazifop (0.125 – 0.250 kg/ha) or Imazethpyr @0.75kg/ha.

Weed Management In Pigeonpea

1. Being a long duration crop it require 2-3 hand weedings.
2. Pre-emergence application of pedimethalin 0.75-1.0kg/ha or alachlor (1-1.5kg/ha) to control grasses and broad leave weeds.
3. Post-emergence application of quizalofopethyl @0.04-0.05kg/ha

Weed Management In Sugarcane.

Herbicide recommended a.i.kg/ha	Time of application
Atrazine 1.25 kg/ha	PRE-3-4 DAP and at final earthing up
Metribuzine 1.0 kg/ha	PRE 3-4 DAP and at final earthing up
Diuron 1.0 kg/ha	PRE 3-4 DAP
Pendimethalin 1.0 kg/ha	PRE 3-4 DAP
Alachlor 1.5 kg/ha	PRE 3-4 DAP

Herbicide recommended a.i.kg/ha	Time of application
2,4-D 1.0-2.0 kg/ha	POST 60 DAP
Paraquat 0.5-1.0 kg/ha	POST and as Follow up application
Glyphosate 1.5 – 2.0 kg/ha	Effective against all weeds except perennial weeds

Thank You!

AgriGates

Exploring frontiers in agriculture

Lets Discuss Now..

Let ‘s Discuss

- Which among the following is a pre emergent herbicide in rice?

a) Pretilachlor
b) Diclofop-methyl
c) Clodinafop-propargyl
d) fenoxoprop – pethyl.

- 1 st herbicide used in world:

a) 2,4 D
b) Glyphosate
c) Simazine
d) Atrazine

- A non-selective contact herbicide

a). Glyphosate

b). Paraquat

c). 2,4-D

d). None

- Herbicides inhibiting Acetolactate Synthase (ALS) associated with making of leusine, isoleucine and valine

a). Ureas

b). Sulfonylureas

c). Chloracitamides

d). Bipyridilliums

- Phalaris minor has developed resistance to isoproturon in Punjab and Haryana in
- a). Rice
- b). Wheat
- c). Sugarcane
- d). Cotton
- A pre plant incorporated herbicide :
- a). Paraquat
- b). Delapon
- c). Uracils
- d). Fluchloralin

- Which herbicide not belong to triazine group

a).Atrazine

b).Metribuzin

c).Bentazon

d).Ametryn

- Glufosinate is a contact herbicide whereas glyphosate is systemic herbicide:

a. True

b. False