



HERBICIDE RESISTANCE

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What are Herbicides?

Herbicides are chemicals that are sprays on the garden used to kill weeds.

They are generally a last resort for home gardeners.

They have several advantages and disadvantages.



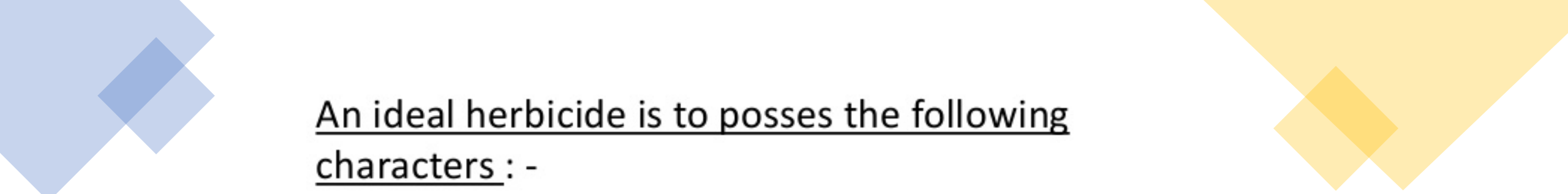
An ideal herbicide is to possess the following characters:

Capable of killing weeds without affecting crop plants.


Not toxic to animals and microorganisms.

Rapidly translocated within the target plant.

Rapidly degraded in the soil.



An ideal herbicide is to possess the following characters : -

1. Capable of killing weeds without affecting crop plants
 2. Not toxic to animals & microorganisms
 3. Rapidly translocated within the target plant
 4. Rapidly degraded in the soil
- ✓ Commercially available herbicides is that they cannot discriminate weeds from the crop plants .
 - ✓ For this reason , crops are also affected by herbicides hence the need to develop herbicide resistance plants
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Effects:

when herbicides are sprayed on fields, they cannot distinguish from crops and weeds. Scientists have developed GM crops that are resistant to Herbicide resistant crops.

Several classes of herbicides are effective for broad spectrum weed control.

Act by inactivating vital enzymes (involved in photosynthesis).

To face this problem, herbicide resistant plants are generated.



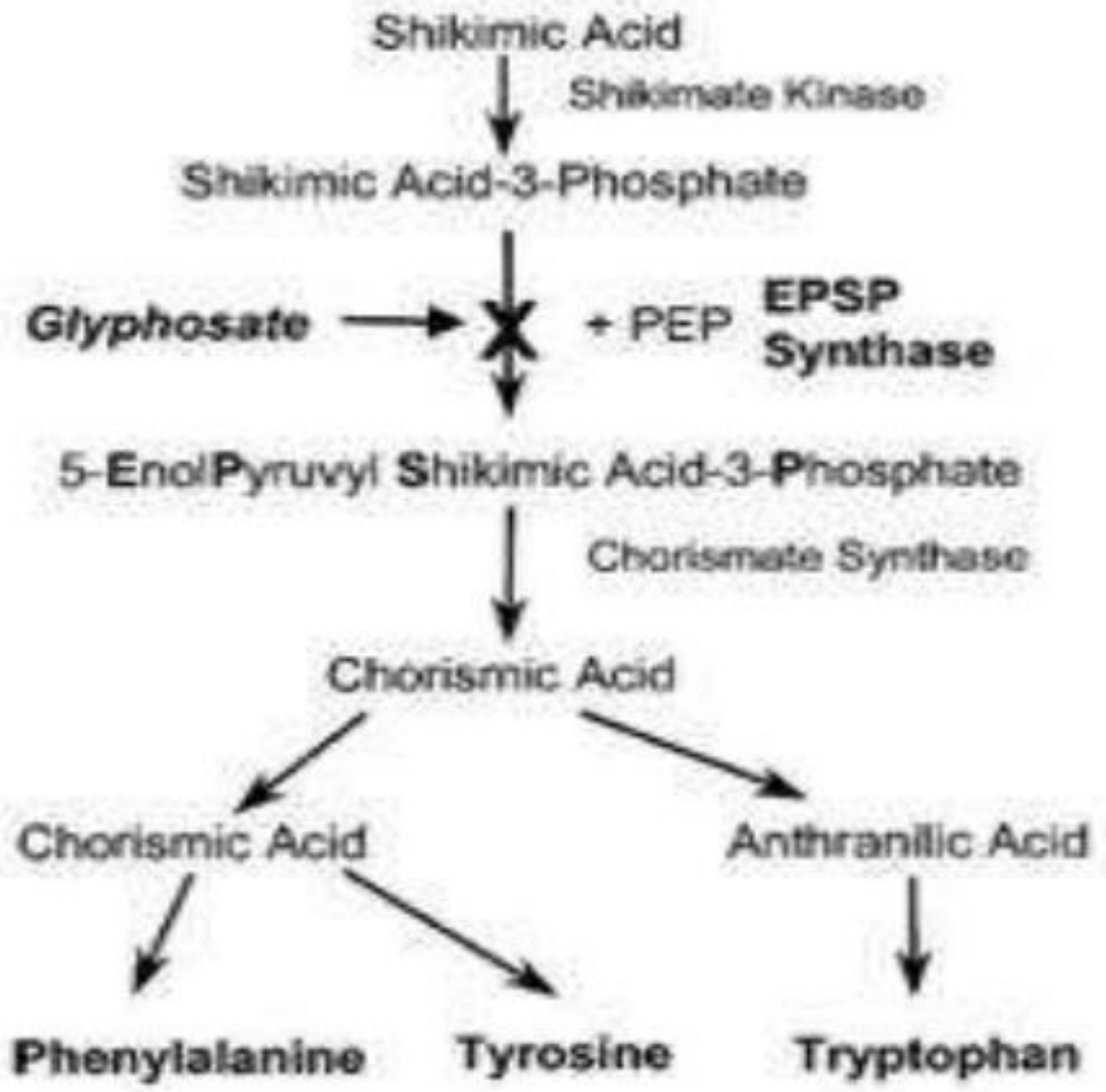
- ✓ Weeds are unwanted & useless plants that grow along with the crop plants .
- ✓ Weeds compete with the crops for light & nutrients, besides harboring various pathogens .
- ✓ So it is estimated that the worlds crop yield is reduced by 10 – 15 % due to the presence of weeds.
- ✓ To tackle the problem of weeds , modern agriculture has developed a wide range of weed killers (herbicides) .
- ✓ Herbicides are broad spectrum as they can kill wide range of weeds.

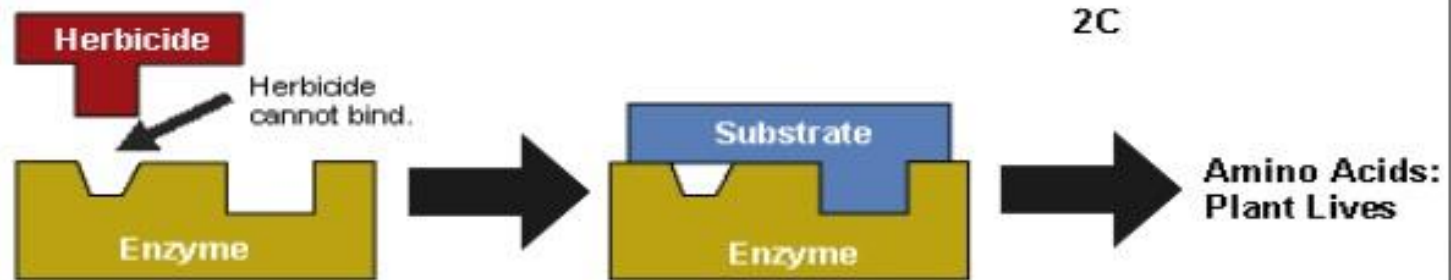
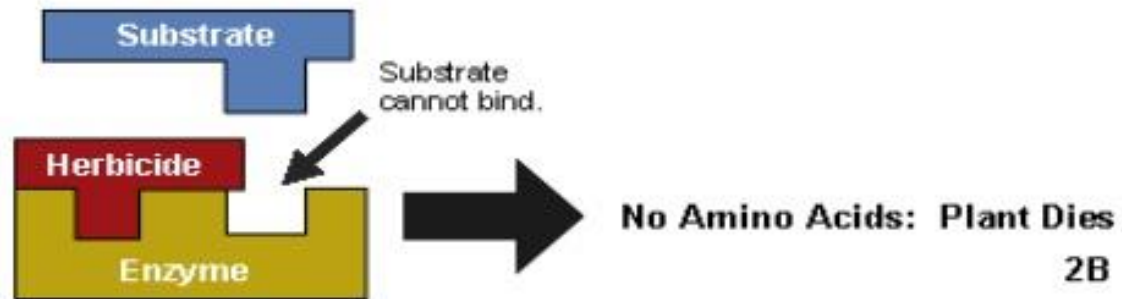
Glyphosate




- ✓ It is a broad spectrum herbicide , effective against 76 of worlds worst 78 weeds .
- ✓ Less toxic to animals , is rapidly degraded & short life span .
- ✓ The american company (Monsanto) market it as round up .

Mechanism of Glyphosphate action :-

- ✓ Capable of killing the plants in low conc .
- ✓ Rapidly transported to growing tissues .
- ✓ It is competitive inhibitor of EPSPS (a key enzyme shikimic acid path way





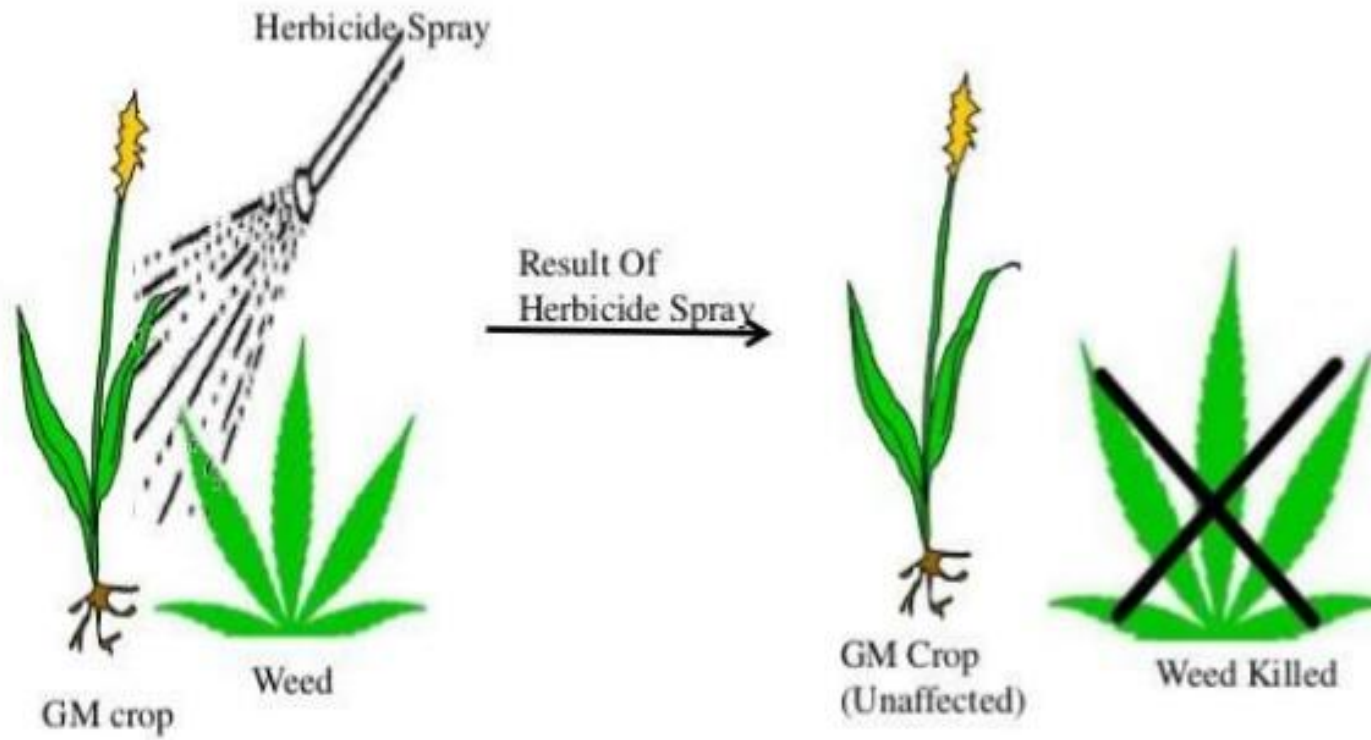
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- ✓ Shikimic acid pathway results in the formation of aa, phenols , metabolites .
 - ✓ Glyphosate binds with EPSPS & blocks metabolism (sa) .
 - ✓ Thus biosynthesis of aa & other products are inhibited .
 - ✓ So cell division & plant growth are blocked .
 - ✓ S pathway doesn't occur in animals .
 - ✓ So it is not toxic to animals
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ADVANTAGES OF USING HERBICIDES

- Broad spectrum of weeds controlled
- Reduced crop injury
- Reduced herbicide carryover
- New mode of action for resistance management
- Crop management flexibility and simplicity
- Use of herbicides that are more environmentally friendly

Herbicide Tolerance

- Over 63% of Gm crops grown globally have herbicide tolerance traits.
- Herbicide tolerance is achieved through the introduction of a gene from a bacterium conveying resistance to some herbicides. In situations where weed pressure is high, the use of such crops has resulted in a reduction in the quantity of the herbicides used.



Most Important Herbicide-Resistant Species

- | | | |
|-----|----------------------|-------------------------------|
| 1. | Rigid Ryegrass | <i>Lolium rigidum</i> |
| 2. | Wild Oat | <i>Avena fatua</i> |
| 3. | Redroot Pigweed | <i>Amaranthus retroflexus</i> |
| 4. | Common Lambsquarters | <i>Chenopodium album</i> |
| 5. | Green Foxtail | <i>Setaria viridis</i> |
| 6. | Barnyardgrass | <i>Echinochloa crus-galli</i> |
| 7. | Goosegrass | <i>Eleusine indica</i> |
| 8. | Kochia | <i>Kochia scoparia</i> |
| 9. | Horseweed | <i>Conyza canadensis</i> |
| 10. | Smooth Pigweed | <i>Amaranthus hybridus</i> |

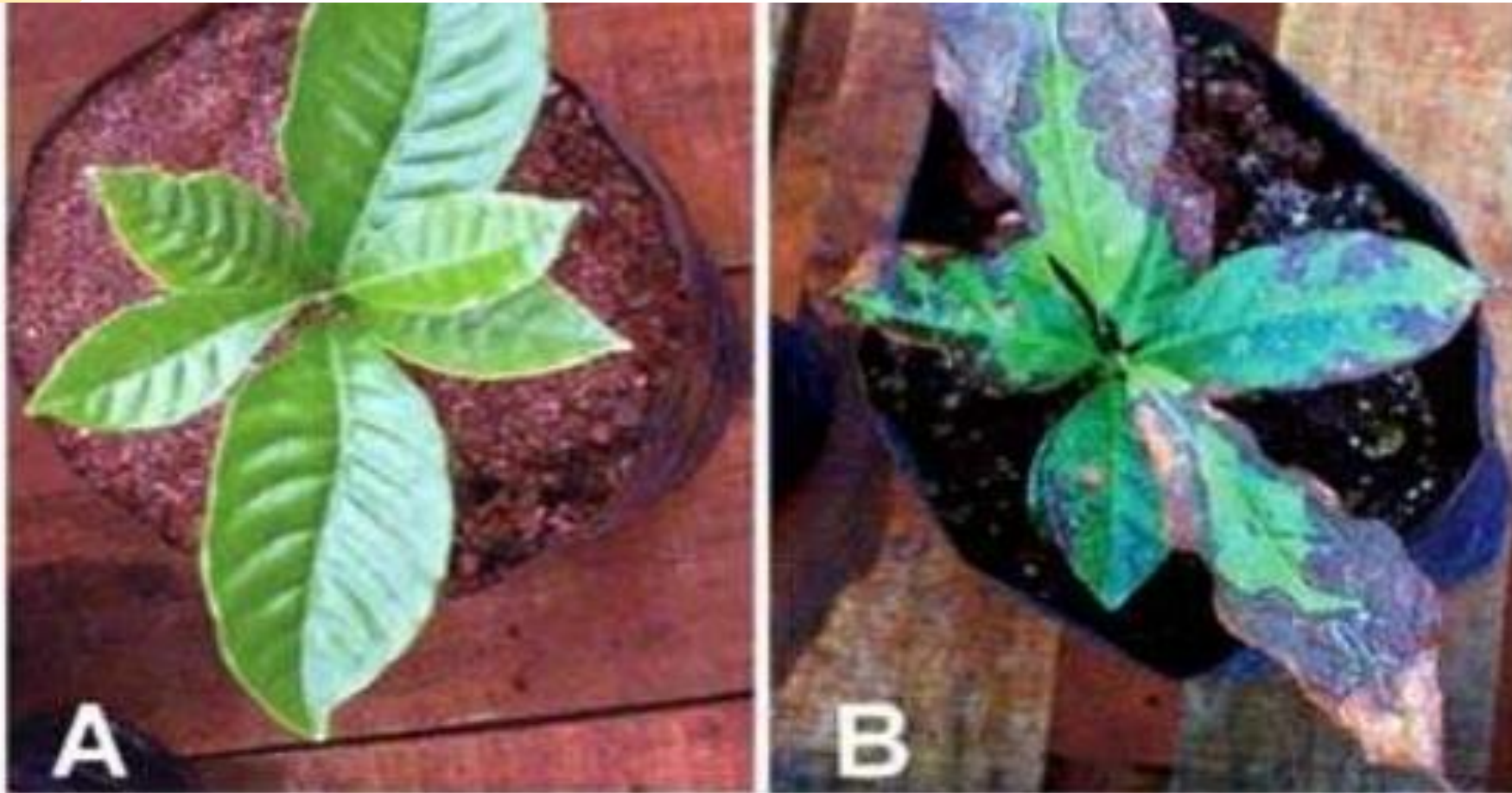
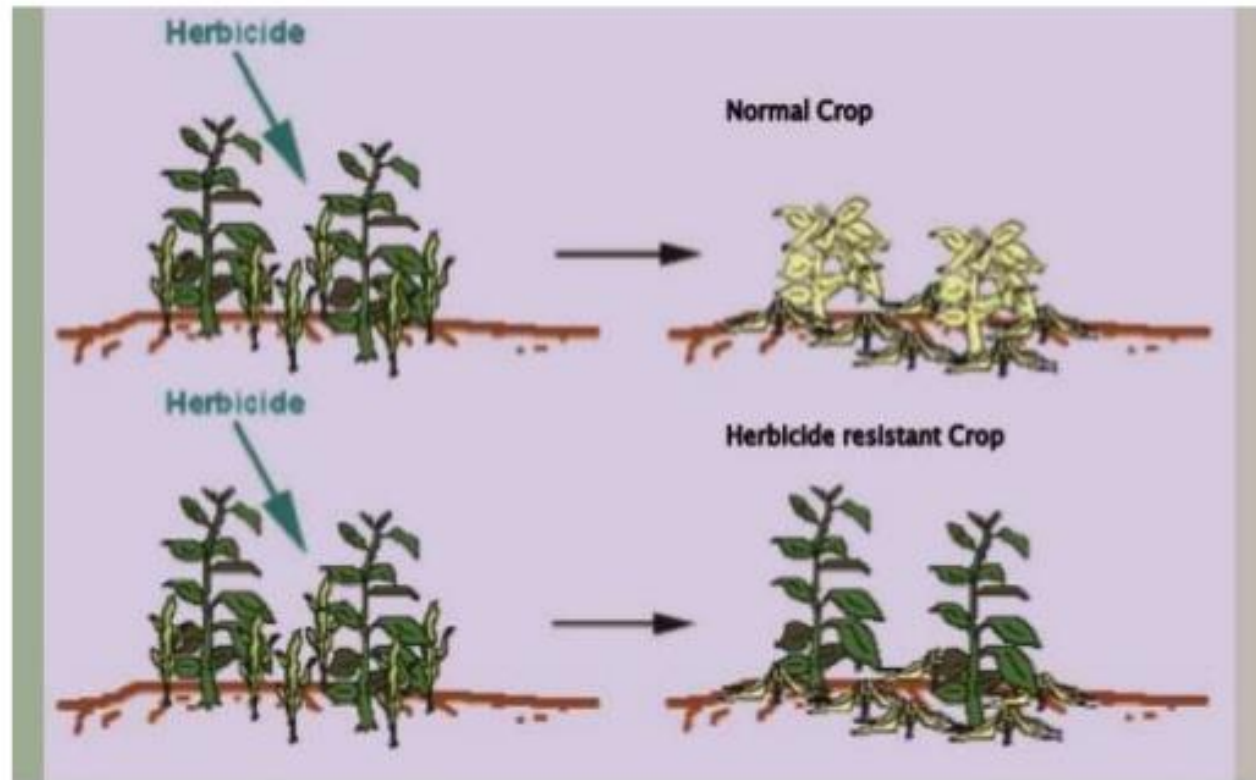


Figure 1. Herbicide tolerant coffee plant (A) and non-transformed plant (B), one week after spraying with ammonium glufosinate at 200 mg.L^{-1} (Ribas et al., 2006).

Herbicide resistant crops:



Examples:

The Most common forms of herbicide resistant crops are;

Soybean,

Maize,

cotton,

tomato,

rice,

potato,

tobacco,

sugar beet,

Wheat.



Thank you.....

