forming extractable conjugates which are then incorporated into normal plant components.

Glyphosate has virtually no selectivity for weeds or turf. It controls annuals, biennials, and perennials - both herbaceous and woody species. Effective kill of perennials is dependent upon translocation characteristics at time of treatment. Basipetal movement or downward flow of photosynthates generally represents a period of greatest vulnerability since glyphosate follows the flow of photosynthates. This usually occurs near anthesis or flowering in most perennials. Phytotoxicity is slow to develop requiring one to two weeks with most perennials. Selectivity is currently being achieved in a number of crop situations through the use of specialized applicators. Rope and wick applications, wipers, and shielded equipment are used where the weed is exposed to glyphosate and the crop is protected.

Ethofumesate is used for selective preemergence annual broadleaf and grass weed control. It appears to act as a growth regulator. Plant selectivity seems to be due to rapid metabolism and reduced translocation in tolerant plants. Differences in root absorption are not a factor in its selectivity.

Quinclorac has visual symptoms in clover which include twisting within 1 to 2 days following application. In grasses, stunting, chlorosis, and gradual reddening occur in 7 to 14 days, followed by necrosis and death.

Mechanism of action

Bentazon appears to inhibit photosynthesis by interfering with photosynthetic electron transport in photosystem II.

Glyphosate prevents selected amino acid and protein synthesis. Specifically, it inhibits enolpyruvylshikimate-3-phosphate synthase (ESPS) in the aromatic amino acid biosynthetic pathway in plants (shikimic acid pathway, pathway for phenylalanine and tryptophan production). It may also inhibit or repress two enzymes, chlorismate mutase or prephenate dehydratase, in this system. Genetic engineers are working on glyphosate-resistant plants by two methods: (1) mutation of the target site of ESPS; or, (2) overproduction of ESPS synthase to overcome glyphosate's phytotoxic effects.

Ethofumesate's mechanism of action is not fully known. It is believed to inhibit photosynthesis and respiration.

Oxadiazon appears to affect young shoots as they grow through the treated zone. Possible effects include mitotic inhibition. Light is required for herbicidal activity as **oxadiazon** has been reported to effect chlorophyll biosynthesis.

Quinclorac has a plant hormone type mode of action.

Degradation

Bentazon is rapidly metabolized in tolerant species, forming extractable conjugates which are then incorporated into normal plant components.

Glyphosate probably undergoes hydrolysis initially to give the free acid form. Glyphosate can be metabolized in plants to give CO_2 and natural products. However, plants do not metabolize glyphosate to a significant degree and effects can persist for long periods of time.

Ethofumesate is metabolized in tolerant plants to a major and minor conjugated metabolite. Residue levels generally decline during plant growth.

Oxadiazon is metabolized into non-toxic metabolites and appears to be the major means of degradation in resistant plant species.

Quinclorac. Metabolism studies are in progress.

Behavior in Soils

Adsorption and leaching

Bentazon is not highly adsorbed in soils, even in organic or fine textured soils; therefore, readily leaches but rarely reaches below 10 to 12 inches. Non-volatile.

Glyphosate is adsorbed strongly by soil colloids and rendered biologically unavailable. The mechanism of adsorption has been proposed to be similar to phosphate fixation with clay minerals. Little leaching occurs due to this degree of adsorption. Adsorption is a form of inactivation since virtually no preemergence activity is observed with soil applications. Turf usually can be planted directly into treated areas.