

RESPONSE OF CONYZA SP. TO CHEMICAL WEED CONTROL

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INTRODUCTION

The use of herbicides in agriculture become very important tool to control weeds. However, the continuous use of the same herbicides on each of the crop in rotation would speed up the evolution of herbicide-resistant weeds. This phenomena had been recorded in the United States; Europe as United Kingdom, France, West Germany and Italy; Canada; Japan and recently observed in Egypt in Conyza linifolia weed at Tahrir zone. This phenomena also had many faces, one face it will create a problem to manufactures to formulate new herbicides had broaden action and consequently increase the costs of herbicides and increase the damage to wild life ; other face of resistance, to use it in studying the mechanisms of action of herbicides and the possible transfer of resistance character from one plant (e.g. weed) to another plant (e.g. crop).

The present work was designed to study the nature of resistance of Conyza linifolia weed to the contact toxicity of bipyridylum herbicides in Tahrir region after continuous application of paraquat herbicide for a period of 10- 15 years; physiological and anatomical changes of both resistant and susceptible plants related to this phenomena at different growth stages and the role of nitrogen fertilization in modifying resistance were investigated. The investigation was

extended to find an alternative effective herbicides to be rotated with paraquat to avoid such problem in future.

REVIEW OF LITERATURE

To simplify the presentation, literature of the nature of resistance of weeds to bipyridylum herbicides will be reviewed under the following topics :

- I- The evolution of herbicide resistance in weeds.
- II- The development of tolerant weed species biotypes to bipyridylum derivatives with special reference to Conyza linifolia.
- III- Mechanism of resistance to bipyridylum derivatives in weeds.
- IV- The response of weeds to bipyridylum derivatives under nitrogen fertilization .
- V- Methods of controlling herbicidal resistant biotypes of weeds.

I- The evolution of herbicide resistance in weeds :

Harper (1956), hypothesized that resistant types may be selected in weed populations that have been exposed repeatedly to certain permanent herbicides as has occurred in insect and microbial populations .

Hammerton (1968), reported that leaf stage and growth habit are important factors which determine spray retention and interspecific variation in these characters may produce

a parallel variation in resistance to herbicides.

Hammerton (1966), and Jacobsohn and Anderson (1968), demonstrated that the evolution of a character depends on the presence of genetic variation for that character and the evolution of herbicide resistance is no exception; and the presence of variation in herbicide resistance within weed species has been well documented.

Hodgson (1970), found that is little evidence that field resistance to a herbicide has arisen as a result of natural selection for morphological or anatomical characters, like a cuticle thickness.

Holliday et al. (1976), quoting Peabody (1973) and Bandeen (1975), stated that where a crop is dependent on one particular herbicide for effective weed control, conditions may occur favouring parallel evolution of resistance in weed populations .

Holliday et al. (1976), applied the term "resistance" to a weed population within a species which is normally susceptible to a particular herbicide but which is no longer controlled by that herbicide in a particular area. Mechanisms of physiological or biochemical resistance may be grouped into, (a) differential absorption or uptake, (b) differential translocation of herbicides to active sites, and (c) metabolic conversion or detoxification of herbicides .

Tomkins and Grant (1977), stated that the use of herbicides exhibiting similar modes of action when sprayed on the same area year after year has imposed new factors of selection; either by radical changes in the mutual competition between present weed species or by increasing tolerance or even resistance of species or strains within species that had been susceptible in the past.

Gressel (1979), observed that the selection pressure (rate of kill) of herbicides is up to 90 - 95 %, the greater the kill rate (short of 100), the more rapid is the enrichment for resistant strains and 90 % kill would give a ten-fold yearly enrichment of resistants in the population and a completely resistant population in 10 years. However, in practice, the 90 % kill initially is much reduced to 60 - 80 % by the seed production of survivors.

Putwain and Holliday (1979), stated that the evolution of herbicide resistance is determined by, (a) the selection pressure of the herbicide, (b) the genetic structure of weed population, and (c) the population dynamic of weed species.

LeBaron and Gressel (1982), reported that Conyza linifolia, Erigeron philadelphicus and Poa annua an annual weed species, previously susceptible to paraquat herbicide have been found to be resistant by repeated applications. Characteristics that can be recognized based on herbicide -

-resistant species include, (a) herbaceous annuals, (b) at least partially self- fertile, (c) rapid development to maturity, and (d) normal biotype very sensitive to the herbicide.

Bandeem et al. (1982), and Gressel et al. (1982), reviewed that most cases of herbicide - resistant weeds throughout the world occurred where the crops were grown, (a) monocultural, (b) used a sole herbicide, (c) repeated the sole herbicide for long time. In the same mean, the use of high levels of herbicides; often the same or similar herbicides frequently and monocultures or limited crop rotations were evolved a herbicide- resistant in weeds.

Cavers (1985), in England, demonstrated that continual alternation between two classes of herbicide may eventually give use a single weed population that is tolerant of both types, for example Poa annua is already resistant to both triazine herbicides and paraquat a bipyridylum herbicide.

II- The development of tolerant weed species biotypes to bipyridylum derivatives :

The appearance of bipyridylum resistant weeds is now a well documented phenomenon by many investigators .

Wright (1968), showed that in the absence of any direct selection pressure for development of tolerant to bipyridylum herbicides, varieties of both Italian and perennial rye grass exhibited differences in susceptibility to paraquat.

Lovelidge (1974), revealed that paraquat tolerance has also arisen under strong selection pressure in perennial rye grass and has been exploited in the development for agricultural purposes of paraquat tolerant lines of perennial rye grass. These lines exhibit tolerance to all stages of the life cycle but the degree of tolerance is dependent on growth stage, growth conditions and method of herbicide treatment.

Faulkner (1975), showed a certain bread lines of Lolium perenne are tolerant to paraquat and diquat but susceptible to a wide range of other herbicides .

Faulkner (1976), showed a new paraquat resistant variety of Lolium perenne. In plots with the above 'resistant' variety, paraquat applied at 0.3 kg a.i./ha almost eliminated the weed grasses, leaving an even sward of resistant variety and leading to a much increased yield of the L.perenne component and higher digestibility of herbage. In plots with susceptible variety, the same treatment left a less

even sward and had a smaller beneficial effect on botanical composition, a somewhat greater effect on digestibility , and a much more severe effect on total herbage yield.

Gressel et al. (1982), quoting Hawkins and Parham (1979), reported that a tolerant line of Poa annua has arisen under unusually strong selective pressure as a result of continued use of paraquat as the sole method of controlling annual weeds in a market garden in England. They found normal Poa annua is killed by 0.1 to 0.2 kg/ha paraquat, but more than 0.8 kg/ha is required to kill the tolerant strain.

Gressel et al. (1982), quoting Hawkins and Parham (1979), reported that a resistant Conyza linifolia has appeared in vine and citrus treated five times annually with paraquat in Egypt .

Youngman and Dodge (1981), stated that a rate of 10 kg/ ha paraquat is now required to control Conyza linifolia resistant to paraquat herbicide.

Gressel et al. (1982), quoting Watanable (1981), stated that Eriqron philadelphicus has become resistant to paraquat in Japan . Such weed has been treated with paraquat about 2 to 4 times each year since 1969. Selected biotypes can withstand levels of paraquat well beyond those necessary to kill the susceptible biotypes.

Gressel et al. (1982), reported that Poa annua is already represented by populations resistant or tolerant to triazine herbicides in France; to paraquat (a bipyridylum herbicide) , in England, and to metoxuron a urea herbicide in experiments in Europe.

Harvey and Harper (1982), reviewed that the tolerance to paraquat has arisen in populations of an annual weed , Conyza linifolia, growing in citrus and vine plantations where paraquat has been applied up to eight times annually for 9 years . Under green house conditions, these populations showed tolerance to paraquat at application rates up to the equivalent of 10 kg/ ha, thus displaying an approximately five folds greater tolerance to the herbicide than do normal plants of the species. They concluded that varieties of a given species may differ in susceptibility to bipyridylum herbicides , and in some species tolerance has been developed by selection pressure.

Fuerst et al. (1984), reported that a biotype of Conyza linifolia originating in Egypt has developed resistance to the herbicide paraquat. The resistant biotype can tolerance approximately 100 times more paraquat than wild type.