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# Reversal of Isoproturon Resistance by Malathion in *Phalaris minor* Retz.

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Studies on the mechanism of development of resistance of *Phalaris minor* to isoproturon have indicated that there is an increased degradation of isoproturon by increased activity of the enzyme cytochrome $P_{450}$ monooxygenase in the resistant biotypes (Singh *et al.,* 1998a, b). Malathion, an inhibitor of this enzyme, has been used to detect the involvement of this enzyme in the degradation process of the herbicides ( Kranz and Pfister,1992; Christopher *et al.*, 1994). It was considered of interest to study the effect of malathion on growth of isoproturon resistant biotypes of *P. minor* and wheat with a view to exploit its use in case it caused differential suppression.

Experiment was conducted in **rabi** season of 2000 and repeated in 2001 and 2002.The susceptible population of *P. minor* used in the study had $GR_{50}$ value of 0.4 kg $ha^{-1}$ and the resistant population had $GR_{50}$ value of 2.25 kg $ha^{-1}$ for isoproturon. Seeds (50-100) were sown in pots (6" dia) in the month of November in five replicates for each treatment. Seeds of wheat variety PBW 343 were sown (5-10 per pot) a week later than the weed seeds so that the crop was at the same leaf stage at the time of spray as the weed. The weed plants were thinned to 20 per pot and wheat plants five per pot one week after emergence. For spray, the pots were kept in 8 sq m area and malathion (1000 g $ha^{-1}$) alone or in combination with 1 and 2 kg $ha^{-1}$ isoproturon was sprayed with knapsack sprayer when the plants attained 2-3 leaf stages i. e. 30-35 days after sowing. The plants that remained unsprayed with either of these served as controls. Also plants that received just malathion or isoproturon treatment were maintained to serve as checks on the combination treatments. Data on per cent mortality, plant height and fresh weight accumulated were recorded 28 days after spray.

Susceptible population was killed by isoproturon alone (1.0 and 2.0 kg $ha^{-1}$). Isoproturon at 1.0 kg $ha^{-1}$ had no phytotoxic effect on the resistant population and around 15% population was killed at 2.0 kg $ha^{-1}$. A combination with 1000 g $ha^{-1}$ malathion increased the phytotoxic effect in the resistant biotypes. It increased to 50% with 1.0 kg $ha^{-1}$ and to 80-90% with 2.0 kg $ha^{-1}$ isoproturon. In wheat also, 50% mortality could be observed in combination with 2.0 kg $ha^{-1}$ isoproturon. Data on plant height and fresh weight accumulation reveal similar trends (Table 1).

Table 1. Effect of malathion alone and in combination with isoproturon on susceptible and resistant biotypes of *Phalaris minor* Retz. and wheat

| Plant type | Malathion (g $ha^{-1}$) | Isoproturon (kg $ha^{-1}$) | | |
|---|---|---|---|---|
| | | 0 | 1.0 | 2.0 |
| | | Percentage mortality | | |
| Susceptible | 0 | 0 | 100±0 | 100±0 |
| Resistant | 0 | 0 | 5±0.4 | 15±1 |
| Wheat | 0 | 0 | 0 | 0 |
| Susceptible | 1000 | 0 | 98±2 | 100±0 |
| Resistant | 1000 | 0 | 45±2 | 90±5 |
| Wheat | 1000 | 0 | 0 | 50±2 |

This supports the earlier findings and the reversal of herbicide resistance with the use of piperonyl butoxide and aminobenzotriazole (Singh *et al.,* 1998a, b). Though malathion could cause the suppression of resistant biotype of *P. minor* yet it cannot be exploited for control of the resistant biotypes in the fields as it lacks selectivity because of the sensitivity of the crop to this combination.

## REFERENCES

Christopher, J. T., C. Preston and S. B. Powles, 1994. Malathion antagonises metabolism based chlorsulfuron resistance in *Lolium rigidum*. *Pestic. Biochem. and Physiol.* **49** : 172.

Kranz, K. and R. Fonn 9-Pfister, 1992. Herbicide-insecticide interactions in maize : Malathion inhibits cytochrome P-450 dependent primisulfuron metabolism. *Pestic. Biochem. and Physiol.* **43** : 232-240.

Singh, S., R. C. Kirkwood and G. Marshall, 1998a. Effect of the monooxygenase inhibitor piperonyl butoxide on the herbicidal activity and metabolism of isoproturon in herbicide resistant and susceptible biotypes of *P. minor* and wheat. *Pestic. Biochem. and Physiol.* **59** : 143-153.

Singh, S., R. C. Kirkwood and G. Marshall, 1998b. Effect of ABT on the activity and rate of degradation of isoproturon in susceptible and resistant biotypes of *Phalaris minor* and in wheat. *Pestic. Sci.* **53** : 123-132.