

Project Title : Researches on Sulfonylurea Herbicide Resistance in Wild Mustard *Sinapis arvensis* L. in Wheat Fields in The Marmara Region of Turkey

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Supporting Body : GDAR

Leader : Muhamet TOPUZ

Co-researchers : Prof. Dr. Yıldız NEMLİ

Summary : Wheat is an important crop for Marmara Region of Turkey. In wheat fields besides other weeds, wild mustard is also frequent and important. In wheat growing areas wild mustard is controled chemically mainly by 2,4-D and sulfonylurea herbicides. It is well known that heavy usage of sulfonylurea herbicides causes herbicide resistance. In Marmara Region wheat is grown as a monoculture or in rotation with vegetables and sunflower where sulfonylurea usage is also common. With this study it was determined that wild mustard developed resistance to sulfonylurea herbicide chlorsulfuron and this is the first report in Turkey of a broad-leaved weed species, resistant to ALS inhibitor,resulting from the use of sulfonylureas. Chlorsulfuron resistant wild mustard populations were tested with some other sulfonylurea herbicides such as imazamethabenz-methyl, metsulfuron-methyl, and trifensulfuron, for cross-resistance and atrazin and 2,4-D for multiple resistance. Chlorsulfuron resistant populations such as KNF3, KNF4 and MRS6 were found cross-resistant to trifensulfuron, while they were susceptible to all other applied herbicides. In the management of chlorsulfuron resistant wild mustard in wheat areas it was concluded that, herbicides such as 2,4-D, imazamethabenz-methyl, and metsulfuron-methyl can be recommended as a chemical control alternatives. Herbicide resistant and susceptible wild mustard populations were compared for germination and fittness patterns with aim to obtain information related to the management of resistance in farmers conditions. Greenhouse, laboratory and temperature controled growth chamber studies showed that resistant populations are germinating in high rations compared to susceptible ones. Molecular studies were conducted with aim to determine the molecular basis of the mechanism of resistance. With protein studies total, membrane and soluble proteins extracted from seed, leaf and rosette stages of wild mustard resistant and susceptible populations were compared on proteom level. A significant difference between seed membrane proteins of wild mustard resistant and susceptible populations were found. DNA studies were conducted as partial ALS gene sequence of wild mustard resistant and susceptible populations with aim to find the points of mutations being due to protein

change and resistance. The multiple alignment of sequenced ALS of resistant and susceptible wild mustard showed that there are point mutations but not in pro197 and trp 574 which are normally points where mutations results in amino acid changes. Enzyme assays showed that in chlorsulfuron resistant populations the ALS enzyme was not inhibited and that altered target site is the reason for wild mustard resistance. It was concluded that with full ALS gene sequence the mutation or mutations points can be found.