

Success Story under RKVY

1. **Title** - Strengthening and Development of Agrochemicals Residue Laboratory for Environmental Components and Food Commodities, Department of Agronomy, CCS Haryana Agricultural University Hisar
2. **Category**- Agriculture

Most significant achievement/success story

People of Haryana are facing the severe health hazardous due to the persistence of the pesticides/herbicides residues in soil, water and the edibles. Reports from Health Department of Haryana during 2008-2009 clearly indicated that the number of cancer and heart patients increased to 12% in last one and half decade. Similarly the early pubertal attainment in children, early menopause cases in women (even in the age of 35), increased miscarriage cases and problems related to mental disorders in infants has been increased to surprising level in last two decade. Though there is not much research to support the reason of pesticide/herbicide residues behind all these health problems. But we can't forget the case of Endosulfan ban in India on the ground that it is playing with the health of the peoples. The best example is from Kasargod, Kerala where lot of genetic deformation has been observed after the spray of Endosulfan on cashew nut trees in early nineties. So there is a need of proper monitoring of the persistence, dissipation behavior and safe waiting period of various pesticides/herbicides (in special reference to newly introduced molecules) in various agricultural produces and environmental components. With the aim to develop and strengthen the infrastructural and research facilities for testing of agrochemicals residues, the project 'Strengthening and Development of Agrochemicals Residues Laboratory for Environmental Components and Food Commodities' was sanctioned during 2011-12 for Rs. 63.80 lacs by the state level sanctioning committee RKVY. The project has been implemented in time and the Agrochemical Residue Laboratory was established in 2013 and working satisfactory. In 2014-15 with the another RKVY sponsored project on 'Strengthening of Agrochemicals Residues Laboratory using state of the art analytical instruments' the research facilities were upgraded by purchase of new analytical instrument GCMS/MS which is very much required for confirmation of tested molecules along with trace level analysis of agrochemicals residues in various food commodities and environmental components. Today Agrochemicals Residues Laboratory is well equipped with state of the art analytical instruments facility for research purpose and providing excellent results in the research area and serving the farmers'. This has become possible only due to the funding provided under RKVY schemes.

3. Challenge

1. To develop new analytical methods for detection of agrochemicals residues from soil and crop produce will be standardized following 'green chemistry'.
2. Studies on persistence and residue estimation of agrochemicals in long term trials.
3. Estimation of residues of new molecules, in crop produce and soil and their residual effects on succeeding crops may be investigated.
4. Regular monitoring of agrochemicals residues in underground water, crop produce and soil at farmer's field as a mandatory practice.

5. Studies of agrochemicals metabolite and the factors governing these metabolites formation may be studied.

4. Imitatives

1. Standardization/validation of analytical methods was done for residues estimation of various herbicides using HPLC and GCMS/MS.
2. Optimization of new analytical techniques for various herbicides was performed.
3. Evaluation of pesticides residues in *Kharif* and *Rabi* crops, soil and water samples collected at farmers' field from various rice-wheat growing regions of Haryana so as to generate basic information of the persistence of herbicides residues in soil and food commodities.
4. Evaluation of the $t_{1/2}$, safe waiting period, persistence, dissipation, adsorption, desorption, leaching behaviour of various agrochemicals.
5. Metabolic study of various agrochemicals in environment.
6. Herbicides residues study in long term CA, DSR experiments and other high value crops like turmeric, sugarcane etc.
7. Residual effect of long term application of various herbicides in rice-wheat cropping sequence.
8. Formulation of various safety measures of the pesticides/herbicides and to provide future guidelines to the research and extension workers along with the policy makers.
9. Testing of new pesticides for their residue level in agricultural products and various environmental matrices so as to include these pesticides in University Package of Practices.
10. Research project entitled 'Bio-efficacy, phyto-toxicity, persistence and dissipation study of different herbicides for the control of *Orobanche aegyptiaca*, a parasitic weed of tomato (*Lycopersicon esculentum* Mill)' was implemented.
11. Research project entitled 'Genetic Improvement of Indian-mustard and Sunflower for Nutritional Quality using Induced Mutation Techniques (BRNS, in collaboration with Department of Genetics and Plant Breeding)' is under implementation.

5. Key result

Weed management in crops always remain a big challenge for farmers and scientific community. This challenge is becoming more and more difficult even when newer technology is developing along with availability of a number of herbicides and new molecules in the market day by day. The reason may be the climatic change due to which weed shift and emergence of new weeds are very prominent. Development of herbicide resistance in weeds is another big challenge which resulted in increase of herbicide consumption to drastic level in last decade. A report says that in Orissa, there is big hike of about 40 percent in herbicide consumption during last two years. But, it is important to realize, however, that inappropriate and indiscriminate use of herbicides may also affect soil health, can cause many environmental hazards and significant risks to human health. Therefore, herbicide residues in soil, crop produce at harvest and underground water (through leaching) are of great concern not only because of health point of view but also because of their sensitivity to succeeding crops. Hence, the knowledge of the potential of herbicides residues to persist in crop produce, contamination in soil and

underground water is important while developing weeds management strategies and recommendation of these herbicides.

Persistence of herbicides residues in long term herbicidal trials on rice-wheat cropping system revealed that the residues of herbicide after continuous application for years at recommended dose, in soil at harvest were below the detectable limit and considered safe to succeeding crop. The harvest time residues in soil and crop produce in controlled experiment were below the MRLs set by EPA and FSSAI.

In persistence and dissipation study of different herbicides, it is concluded that initially the concentration of herbicides in soil and crop remain high which degrade with time and become below MRL at harvest time. Different soil properties like pH, soil texture, moisture, temperature and other climatic conditions affect the herbicides degradation, leaching, adsorption and desorption in soil. Incorporation of green manure increase the herbicide degradation and soil fertility profile. Occurrence of residues in ground water only in the area where water table is shallow is a not a matter of concern as residues found in these areas are near MRL. But occurrence of herbicides residues in food grains and straw at farmer's field should be taken seriously. It may be due to ignorance of recommended spray practices/dose or use of local branded herbicides as under controlled experiments with recommended practices, these herbicides do not show any residues problem either in crop produce, soil and underground water. Hence application of herbicide for weed management at recommended doses in different crops under subtropical humid climatic conditions of Haryana can be considered safe to food, environment, human health and succeeding crop.

6. Impact

1. Upto date information about the residues level in environmental matrix and agricultural produce has been tried to maintain so as to provide guidelines to research and extension workers.
2. Farmers are motivated for the production of residue free agricultural produce and safe and judicious use of agrochemicals.
3. Testing of new Agrochemicals for residues in various agricultural components and produces, to include them in University Packages of Practices so as to make their safe and sustainable use.

7. Supporting images



A



B



C



D

A,B: View of Agrochemicals Residues Testing Laboratory; C,D: Delegates from Afghanistan visited the lab and reviewed the work

