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IPM IN TURKEY

The history of IPM in Turkey goes back as far as the early 1900's. Biological control was introduced as an alternative pest control method in citrus orchards; *Rodolia cardinalis* was released against *Icerya purchasi* in 1910, *Cryptolaemus montrouzieri* (in 1965) and *Leptomastix dactylopii* (in 1969) were released against *Planococcus citri*. *R. cardinalis* eventually got established and solved the problem as long as it was preserved and no pesticides were sprayed. However, the other two could not survive in winter and needed to be released each spring once or twice. Nevertheless, the actual beginning of IPM in Turkey started with a research project on cotton pests which initiated in 1970. That project was followed by apple and hazelnut IPM projects in 1972. The results of these projects were put into practice by larger implementation projects soon after. Moreover, forecasting and warning systems, in apple orchards and vineyard, was established against *Cydia pomonella* and *Venturia inaequalis* based on the results obtained from the IPM research projects. Forecasting and warning projects against *C. pomonella* and *V. inaequalis* were implemented throughout the country in 1981-1988. In the following years, forecasting and warning projects against grape berry moth (*Lobesia botrana*), vineyard downy mildew (*Plasmopara viticola*) were carried out as well. These projects were in fact the first practical IPM projects. Thousand millions Turkish Liras of crop losses were prevented and pesticide consumption and control expenditures were decreased thanks to these projects. For example, the number of sprays against apple scab and grape berry moth were decreased from 7-8 to 1-3 and from 7-8 to 1-4, respectively. In 2007, with the assistance and support of the research institutes, control measures were applied according to the forecasting and warning principles, on 11,924,200 apple trees which were in an inception area of 147 station (115 electronic and 32 mechanic station) in 35 provinces (89 counties), and also 1,301,650 vine stock at the inception area of 50 stations in 17 provinces (44 counties). IPM projects on wheat, tobacco, vineyard, citrus, peach and cabbage were also initiated afterwards. The major pests; their biology, population dynamics, natural enemies and control methods have been investigated. Regional IPM programs have been implemented for each of them.

IPM Policies and Strategies. One of the cornerstones of IPM in Turkey is a set of decisions taken during a meeting organized by Turkish Ministry of Agriculture and Rural Affairs (MARA) on IPM in 1994, whereby policies and strategies in plant protection were determined as IPM and the needs were determined as research, implementation and training. General policies and strategies were designated as follows:

- Plant protection research projects must be considered as countrywide and crop-based IPM projects aimed to solve plant protection problems
- It is mandatory to establish a National IPM Network for each IPM project.
- IPM projects are jointly coordinated by research institutes, universities, agricultural provinces and county directorates, farmer unions and farmer cooperatives.
- It is aimed to increase the number of IPM projects that will be carried out with the coordination and the collaboration of the other research institutes attached to the Ministry of Agriculture and Rural Affairs, General Directorate of Agricultural Research, Universities, TÜBİTAK (Turkish Science and Technology Research Association), the Ministry of Environment, and the International Organizations such as the World Bank, UNDP, FAO, EU, NATO, GTZ and other countries.
- A technical guide is prepared for each crop where IPM is being implemented.
- Preparation of the new IPM projects on wheat, chickpea, lentil, citrus, peach and vineyard in 1994 and putting them into action in 1995 were decided at the mentioned meeting.

The initial 16 IPM projects initiated in Turkey in 1995 reached the number of 25 in 2008. These projects are now prepared based on a new understanding. On one hand, research results obtained up to now are being integrated and implemented by the coordination of the research institutes, agricultural directorates of the provinces and counties, farmers and farmer associations. On the other hand, the research topics necessary for developing IPM programs are

being carried out as subprojects by the research institutes and the results obtained are being integrated in the main IPM program.

The Turkey Agricultural Research Project (TARP), funded by the World Bank, FAO/UNDP operated in 1992-1999. Afterwards, its operation and funding was taken over by the national budget. The objectives of this project is primarily to assist the Government of Turkey in establishing a network of formal cooperation and collaboration between research, training and extension entities, and to develop and apply IPM for implementation by the farmer community in order to reduce the national dependency on agricultural pesticides and to avoid the detrimental effects of these chemicals on the environment, human and animal health, and on the marketability of the production.

IPM implementation. The IPM Central Commission was established to coordinate IPM programs nationwide. This commission consists of 9 members, 2 from General Directorate for Agricultural Research, 1 from the General Directorate of Prevention and Control, 2 from the Plant Protection Departments of the universities and 4 among the IPM National Coordinators.

The Plant Protection and Agricultural Research Institutes are the regional coordinator for each crop in their region, and the experts of the different institutes train the technicians that carried out the project in their provinces or counties. It is clear that the main focus of IPM programs is on empowering growers to become IPM specialists in their own fields, orchards and vineyards. Governmental institutions will only give technical assistance and make training programs; farmers will make their own decisions concerning suitable control measures against pests, diseases and weeds in their fields. It is essential for the Turkish Agricultural Chambers Union (TZOB) and the other grower unions to participate actively both with their budget and man power to the IPM programs, as the IPM projects are prepared for farmers and must be applied by them. Together with the growers, IPM technicians visit the field/orchard, check the plants for problems, and identify solutions to them in full participatory mode.

IPM Projects are implemented according to technical guides prepared by IPM specialists for each crop, first to be used and validated at specific locations where IPM program are being carried out, and later on the guides are disseminated for countrywide implementation.

Growers who have received IPM training pass on the information about IPM and its methods to their neighbors, relatives and friends. In fact, a specific pilot area for an IPM project remains active for 3-5 years, after which period the pilot area is changed to allow other growers to profit from the IPM training and assistance in the project. However, even previously trained growers still remain in contact with the local agricultural directorate for further assistance and also to obtain updates on improved IPM methodologies.

The control strategy is determined as follows:

- Implementation of sound agricultural practices primarily to grow healthy plants
- Early measures for preventing pest infestation and colonization
- Modification of the crop design and creation of adverse biotic conditions that reduce survival of individuals in an area in such a way that a large proportion of the pest population is reduced
- The use of forecasting and warning models for pest management
- Mass trapping and disruption techniques whenever this is possible and available
- Conservation and augmentation of natural enemies as the basis for biological control
- Introduction of biological control agents if needed

The main strategy in chemical control is based on pesticide selection. Correct timing and correct application of chemicals at the correct dosage are essential. The effectiveness of the pesticide on the pest population, and also the side effects of the pesticide are considered when making a choice of the right pesticide. In fact, pesticide selection is made according to the risk assessment formula provided by Matthews (1984).

Training activities in IPM projects. Researchers, project coordinators and leaders are the first to be trained. They prepare the IPM program, including technical guides for implementation and training curricula. Following this, researchers train the IPM trainers, technicians and facilitators, who, on their turn, train the growers. However, researchers also participate in the training activities for the growers at the beginning of the IPM project implementation.

The training programs include the following subjects for each level.

- IPM concept, principles and benefits

- Diagnosis of pest and natural enemies
- Cultivation and fertilization
- Agro-ecosystem analysis
- Control measures and alternative control methods and agents
- Selection of pesticides, the side effects, correct timing and application

Technical instructions, brochures, tablet, and farmer field days are organized for each locality, and news or information programs are prepared for TV channels, radio and newspapers in order to create more awareness and mass training on IPM. Films were prepared and broadcasted for the National Channel in the framework of the Broadcast Training of the Grower Project (YAYÇEP).

However, there are still a few problems related to the implementation and diffusion of IPM at the country level. For instance, IPM implementation remains largely limited to pilot areas. Also, there are logistic problems such as inadequate dissemination of information, insufficient numbers of trained technician, but also the fact that there are no incentives for implementing IPM, as well as the lack of sanctions for incorrect or abusive pesticide application. On the research side, there are still some crops for which no IPM program has been designed yet, and this is mainly due to the insufficient numbers of researchers dealing with IPM. From the grower side, the main problem is that some of the IPM methods such as sampling/scouting, economic threshold are still quite complex notions. Also, sometimes it is easier to follow the advice of pesticide retailers who advocate for blanket spraying.

Although IPM programs are not implemented throughout the country, there are indeed some alternative methods which have been widely used outside the official IPM projects, such as yellow sticky traps, forecasting and warning methods, and preserving natural enemies. For more information, please contact

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IAPPS Mission: to provide a global forum for the purpose of identifying, evaluating, integrating, and promoting plant protection concepts, technologies, and policies that are economically, environmentally, and socially acceptable.

It seeks to provide a global umbrella for the plant protection sciences to facilitate and promote the application of the Integrated Pest Management (IPM) approach to a the world's crop and forest ecosystems.

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