AWARENESS OF PLANT PROTECTION MEASURES AND THEIR ADOPTION BY APPLE GROWERS IN BALOCHISTAN

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Apple is an important temperate fruit of Pakistan. Per hectare yield of apple is very low due to non-adoption of recommendations, especially plant protection measures by the farmers. The present study was conducted in Balochistan, Pakistan. A sample of 355 apple growers was randomly selected from five tehsils selected at random from five apple growing districts of Balochistan. Data were collected through interview schedule and were analyzed with the help of SPSS. Findings showed that almost all the insects/diseases were known to the respondents but at varying percentages. Widely known insects were short hole borer, codling moth and apple maggot. Similarly powdery mildew and apple scab were among diseases. Lorsban appeared only insecticide which was known to and adopted by a vast majority (96.6 and 82.2%) of the respondents to control the insect/pest. Respondents had low level of awareness and adoption regarding the fungicides for the control of diseases. Sanitary and phyto-sanitary measures were very common among the respondents except biological methods for the control of insect/pests and diseases.
Keywords: Awareness, adoption, plant protection measures

INTRODUCTION

Fruits are the most important source of vitamins, minerals and carbohydrates which are very essential for human health and are used in our daily diet. Amongst other fruits, apple occupies a conspicuous place due to its nutritive value and taste. It is nourished in the forms of jams, jellies marmalades, squashed juices etc., besides ripened use (Hartmann *et al*., 1989 and Sharma, 1999). The apple is a native to Asia where wild fruit-growing reaches back to the Neolithic era. The leading apple growing country is China, producing about 41% of the world's apples, followed by the United States, Turkey, France, Poland, Italy, the Russian Federation, Germany, Argentina, Japan, and Chile. Even warmer countries like Iraq and Mexico are able to grow apples in their cooler upland regions. Apple orchards are also found in Siberia where winter temperature falls to –40 ^{o}C (Brown, 1975). It has been grown in Indo-Pak, Kashmir, and northern China since ancient times. Pakistan ranked 16th among apple growing countries of the world in 1999-2000 on the basis of apple production (FAO, 2000).

In Pakistan, various varieties of apple showing great diversity in size, shape, colour and taste are grown from the time immemorial, particularly at high elevations (About 1300 m) in the areas adjoining Afghanistan, Iran and China. The cultivated varieties of apples presently grown in Pakistan have been given the name as *Pyrus malus* Linn. These are grafted on the rootstock *Pyrus baccata* (Crab apple). The best climatic conditions for apple growing prevail in the provinces of Balochistan and NWFP, Azad Jammu & Kashmir, and northern areas of Pakistan. During the year 2002-2003, the total area under apple cultivation in Pakistan was 112.0 thousand hectares with an annual production of 351.2 thousand tones, the average yield being 6.6 thousand tones/ha. (Govt. of Pak., 2006). In-spite of some serious pests and disease problem, there is an increasing trend for bringing more area under apple because of better returns.

Most of the commercially grown apple cultivars in Pakistan require a cooler climate than all other fruits. Apple thrives and fruits best under a relatively cool slow growing season, usually met with at higher altitudes. Therefore, proper selection of varieties is of major importance. Varieties grown in Pakistan are Amri, Kashmiri Amri, Golden Delicious, Red Delicious, Sky Spur, Banki, Kulu etc. Low chilling varieties such as Anna, Summer Gold, Summer Red, Katja and Golden Dorset are giving encouraging results and hence can successfully be grown in lower elevations.

Balochistan is called “Fruit Garden of Pakistan” because of the production of finest quality fruits. The quality of deciduous fruits produced over there is as good as anywhere in the world. This province contributes about 64% of the total apple fruit production of Pakistan (Govt. of Pak., 2006). The climatic conditions and higher altitudes of Quetta, Ziarat, Pishin, Kalat, Loralai, and Zhob districts of Balochistan are highly conducive for the plant growth and quality production of this fruit. However, in Pakistan, the

average yields of horticultural crops are estimated to be only one-third to one-fifth of proven potential (Ahmad, 1994).

These facts reveal that though the climatic conditions are well suited for the production of apple fruit in various districts of Balochistan, yet its yield is very much low which may be due to many factors including severe damage caused by the insect/pests and diseases. The extent of damaged caused by only from codling moth generally ranges 25-80% in Pakistan (Khan and Chaudry, 1989). This severe loss seems to be the result of non-adoption of proper plant protection measures by the apple growers. Therefore, the study was undertaken to identify the extent to which apple growers were aware of and had adopted plant protection measures against insect/pests and diseases of apple.

MATERIALS AND METHODS

A multistage-cum-random sampling technique was used to conduct the study. Five tehsils were randomly selected from five apple growing districts of Balochistan. A comprehensive list of apple growers in the selected tehsils was prepared. Out of total 4761 apple growers from the selected tehsils, a sample of 355 farmers was selected through simple random sampling technique by using the Table for determining the sample size (Fitzgibbon and Morris, 1987). A proportionate sampling procedure was adopted for the selection of farmer respondents from each tehsil. Therefore, 63 from Killa Abdullah, 57 from Muslim Bagh, 73 from Pishin, 80 from Quetta and 82 farmers from Ziarat tehsil were selected. The data were collected with the help of validated and pre-tested interview schedule through personal interviews by the researcher. The data thus collected were analyzed with the help of statistical package for social sciences (SPSS).

RESULTS AND DISCUSSION

a) Awareness about insect/pests and diseases

Table 1. Respondents' level of awareness about insect/pests and diseases of apple

Awareness					
A. Insect/pests	**No.**	**%**	**B. Diseases**	**No.**	**%**
Codling moth	314	88.4	Ripe rot	165	46.5
Apple maggot	271	76.3	Apple scab	287	80.8
Bud moth	173	48.7	Powdery mildew	288	81.1
2-spotted red moth	209	58.9	Fire blight	113	31.8
Hairy caterpillar	220	62.0	Apple rust	151	42.5
Tip borer	260	73.2	Bark split	274	77.2
Quetta borer	248	69.9			
Short hole borer	336	94.6			

i) Insect/pests and diseases: If the harvest is free from insect/pests and diseases, the produce not only appeals to the eye but also fetches high price in the market. However, because of the severe incidence of pests and diseases in the developing countries, many fruits cannot be cultivated on commercial scale (Hashmi, 1994). Production of fruits and vegetables in Pakistan is also limited by this factor. In case of multiple organism invasions, the problem of diagnosing pest and disease attack is complicated. While it is relatively easy to diagnose damage caused by an insect because of its visibility, the damage done by diseases is bit difficult to diagnose because the pathogen is not visible. The respondents were asked about the awareness of insect/pests and diseases and their responses are displayed in Table 1 which reveal that a large majority (94.6, 88.4 and 76.3%) of the respondents was aware of apple insect/pests like short hole borer, codling moth and apple maggot respectively. Whereas, bud moth, 2-spotted red moth, hairy caterpillar, Quetta borer and tip borer were known to 48.7, 58.9, 62.0, 69.9 and 73.2% of the respondents respectively. However, powdery mildew and apple scab were the diseases which were known to a large majority (81.1 and 80.8%) of the respondents. Fire blight, apple rust and ripe rot were known to less than half of the respondents

ii) Chemical control measures: The data presented in Table 2 reveal that pesticides used against pests of apple like Lorsbane, Supracide, Gusathion, Anthio and Folidol were known to 96.6, 69.0, 65.5, 17.0, and 16.56% of the respondents respectively. Whereas, 82.2, 15.2, 8.7, and 5.0% of the respondents had adopted Lorsbane, Gusathion, Supracide and Folidol, respectively. However, none of the respondents had adopted Anthio. Lorsbane appeared to be the most popular pesticide among the apple growers of the area in Balochistan. The use of other pesticides was very low. These results are in line with those of Hayat (1982) and Khalid (1989). However, these findings do not coincide with those of Siddiqui (1991) who indicated that Gusathion was the most popular pesticide and was adopted by a large majority (79.3%) of the respondents.

Table 2. Respondents level of awareness and adoption regarding chemical control measure for apple

I) Chemical control measures	Awareness		Adoption	
a. Insecticides	**No.**	**%**	**No.**	**%**
Gusathion 20 EC/150 cc/100 liter of water/acre	233	65.5	54	15.2
Lorsbane 40EC/1000-1250 ml/ liter of water	343	96.6	292	82.2
Anthio 25EC/400-500ml/ liter of water	61	17.0	_	_
Supracide 40EC/100-150 cc/liter of water	245	69.0	31	8.7
Folidol 605 E /40-60 cc/liter of water	59	16.6	18	5.0
b. Fungicides				
Benlate WP/8-12 oz/liter of water	74	20.8	62	17.4
Zerlate /2 lbs/liter of water	19	5.4	17	4.7
Topsin M-45/70-100 gm/liter of water	70	19.7	69	19.4
Cupravit 50WP/1-1.5 lbs/liter of water	22	6.2	11	3.0
Afugon 30EC/50 ml/liter of water	23	6.3	08	2.2
II) Phyto-sanitary methods				
Trimming/pruning of dead branches	355	100.0	353	99.4
Picking/burial of damaged fruit	355	100.0	353	99.4
Removal of weed from garden (cultural control)	353	99.4	351	98.8
Control of insect/pests and diseases through biological methods	02	0.6	02	0.6

The data presented in Table 2 further reveal that Benlate, Topsin-M-45, Afugon, Cupravit and Zerlate were known to 20.8, l9.7, 6.3, 6.2, and 5.4% of the respondents and were adopted by 17.4, 19.4, 2.2, 3.0 and 4.7% of the respondents, respectively.

iii) Phyto-sanitary measures: An overwhelming majority (99.4-100.0%) of the respondents was aware of trimming/pruning of dead branches, picking/burial of damaged fruits and cultural control measures for removal of weeds from gardens, whereas only 0.6% of the respondents were aware of biological methods to control insect/pests and diseases. Similarly, adoption was also higher (98.8-99.4%) except biological control of insect/pests and diseases which were used by only a fraction (0.6%) of the respondents.

CONCLUSIONS

It can be concluded that the awareness about most of the pesticides was very low. Similarly adoption of all pesticide except one was too low. Moreover, the awareness about fungicides and their application by the growers was very poor.

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