

## Impact of Mango Orchard Diseases on Growers Economic Life in Ahmedpur East, Bahawalpur, Pakistan

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### ABSTRACT

*Current study investigated the mango orchard diseases and its impact on mango growers in Ahmedpur East. Four sample areas i.e. Mehrab Wala, Shahi Wala, Muhabbat Pur Mor and Dera Nawab Sahib were selected and data has been gathered through structured questionnaire using random cluster sampling method. Total 90 mango growers were interviewed. Results indicated that main mango orchard diseases were Die back (48.9%) and Malformation (34.5%). Dust storms (52.2%) were the leading environmental factor damaging mango orchards. Major losses of growers were less profit (41.1%) and less amount of production (36.7%). About 26.6% small growers earned the income of 100,000-200,000 PKR and 47.8% growers earned 200,000-400,000 PKR. Mango losses greatly reduced growers income as 26.6% were faced the losses of 20,000-25,000 PKR and 47.8% were 50,000-70,000 PKR annually. Due to these losses 25.6% growers were facing difficulties of proper household management, 23.3% were troubled to fulfill domestic and social needs. Therefore 70% growers were adopted alternate source of earning where chief source of earning was personal business (49.3%). To minimize the losses of mango orchard diseases it was suggested; use of modern methods of mango plantation, provision of sufficient water, adopts agricultural experts opinions, use of sprays and fertilizers etc.*

**Keywords:** Ahmedpur East, Mango Orchard Diseases, Die Back, Malformation, Household Management

### INTRODUCTION

Mango (*Mangifera indica* L.) is one of the delicious fruit rich in vitamins, minerals and nutritious attributes frequently grown in tropical and sub tropical regions of the world including subcontinent. It is called the king of fruits. Over 160 varieties of mangoes grown worldwide but the most famous varieties grown in Pakistan are Langra, Sindhri, Chaunsa, Sonaro, Anwar Ratole, Samar Bahisht etc. (Khan, 2005). Mango is the 2<sup>nd</sup> largest grown fruit after citrus and occupies the area of 420,079.3 acres with the production of 1,727,000.1 tons annually and fetches a high foreign earning (Fateh et al., 2011). Mango is the national fruit of Pakistan that ranked 4<sup>th</sup> most mango producing country in the world (ICCI, 2011). Mango producing districts mostly are found in Punjab, Sindh and Khyber Pukhtunkhwa (KPK) but Multan and Bahawalpur in Punjab province are dominant growers with the share of 52.4% in overall mango production (Khan, 2005). Despite some mango diseases that can be handled effectively the conditions for high quality yield of mango in Pakistan are exclusively available and are extremely feasible (Usman et al., 2003).

Unfortunately, the mango orchard diseases highly destructive and the core reason for the rapid decline in mango production of mango producing countries like Pakistan. The symptoms of diseases are found alone or in combination with each other in different mango

orchards. A new disease named as quick decline or collar rot has become the most destructive hazard in mango orchards of Pakistan (Mahmood et al., 2002) as it is found in Al Batinah region of Oman where 60% of the mango trees were affected due to sudden decline (Al-Adawi et al., 2003). Mango quick decline (MQD) or Mango sudden death/ decline syndrome (MSDS) is a very destructive disease of mango orchards throughout the mango growing areas of the world (Iqbal and Saeed, 2012) and it has becoming an increasing threat for mango production all around the globe (Masood et al., 2011). In Pakistan, the most frequent bacterial and fungal diseases of mango are powdery mildew; fruit rot, anthracnose, die back, bacterial black spot, malformation etc. (Khalid et al., 2002). In addition, MSDS was found as the most destructive disease in Punjab and Sindh provinces (Kazmi et al., 2005). As in a study, Quick decline showed 100% prevalence in surveyed orchards in 7 Districts of the Punjab province (Mahmood, 2008). Similarly, a survey conducted by Agriculture Sector Linkages Program (ASLP) between Pakistan and Australia observed the main diseases of mango i.e. mango sudden death syndrome (MSDS), mango malformation, powdery mildew, blossom blight, foliar anthracnose and bacterial black spot at different intensities in the visited orchards (Queensland Government, 2006). The MSDS prevalence among the mango trees of different varieties having age groups of 33±5 found highly significant in the vicinity of Tando Qaiser, Sindh (Pakistan) where the maximum prevalence of MSDS was observed in Dusehri variety (34.6%) followed by Sindhri (29.8%) and Desi (25%) (Khaskheli et al., 2011). The tree infected with MQD shows the symptoms of gummosis, canker formation; bark splitting, drying of twigs, branches and curling of leaves (Masood et al., 2010). While twig blight, tip die back, gummosis and bark cracking/ splitting were also noted with 55.0, 50.0, 25.0 and 25.0% prevalence respectively (Iqbal et al., 2007). Likewise another study summed that different diseases like tip die back, twig blight, gummosis, stem bleeding, wilting and bark cracking were prevailing in the mango orchards of Pakistan with 4.2, 3.2, 0.8, 0.5, 0.6 and 1.4% disease incidence respectively (Malik et al., 2005). A disease complex caused by combined attack of several different fungi and abiotic factors was also noted (Jiskani, 2002). It is proved that mango orchards are more prone to diseases as compared to other fruit trees in Fort Abbas tehsil (Bahawalnagar) where the most commonly found diseases were tip die back and anthracnose significantly reducing production as well as orchards area (Ghaffar, 2013).

Besides these diseases, some other associated problems also make the situation much troublesome for the growers of mango. It is noticed that insect pest disease and management are the main causes of this complex problem (Keerio, 2005). The presence of infected trees and improper management practices would ultimately lead to the collapse of the whole mango orchard (Saeed et al., 2012). Resultantly, yield gap is the outcome of poor management practices and post-harvest losses too. It has been found that the majority of growers do not follow the recommendations for an effective use of fertilizer, sprays, and timely irrigation. Post-harvest problems include improper handling, immature fruit harvesting, inadequate transport and storage facilities (Khushk and Smith, 1996). Perishable nature and marketing practices are other factors which affect quality of mango and hence result in low production and growers suffer from losses (Sabir, 2003). For instance, in developing countries like Kenya despite the availability of promising environment not many farmers are cooperating and as a result not optimally exploiting their own possibilities in a highly competitive market (Boersma, 2006). Hence, the main objective of the study is to investigate the mango orchard diseases and their impact on growers' economic life in tehsil Ahmedpur East.

## MATERIAL AND METHOD

Tehsil Ahmedpur East is one of the five subdivisions (tehsils) of district Bahawalpur that is counted in arid and semi-arid region. In summer season, harsh climate and exceeds evaporation turns the area like an oven. Besides, it has a distinctive position regarding mango covered area and mango production in Bahawalpur district. Therefore, it is chosen as a study area. Previously, there is no study has been conducted to find out the main diseases of mango orchards in Ahmedpur East. Thus, data of current study based mainly on primary data gathered through a detailed field survey conducted in tehsil Ahmedpur East. Four sample areas were selected using random cluster sampling namely Mehrab Wala, Shahi Wala, Muhabbat Pur Mor and Dera Nawab Sahib. Total 90 growers were interviewed using a structured questionnaire. After that, data was compiled and analyzed in MS Excel and SPSS 16 software. Results were portrayed in tables.

## RESULTS AND DISCUSSION

In sample study areas mango orchards have been suffered in various kinds of diseases as compare to other fruits and ultimately affect the production on a massive scale.

### Main Types of Diseases

The main types of diseases (Table 1) known from mango growers in study sites were Die back (48.9%) and Malformation (34.5%) whereas Anthracnose (12.2%) and Powdery mildew (4.4%) found on relatively small scale. Common symptoms that were reported and observed were complete defoliation (Die back) and thick growth of male flowers (Malformation). Both kind of diseases proved very harmful for mango production and greatly lessened the production output.

**Table 1. Main Types of Diseases**

<i>Diseases</i>	<i>Frequency</i>	<i>%</i>
Die back	44	48.9
Malformation	31	34.5
Anthracnose	11	12.2
Powdery mildew	4	4.4

### Environmental Factors Affect Mango Orchards

Environmental factors also considered very important regarding the less production of mango (Table 2). These are linked closely not only with mango orchards but also for other crops. In study sites frequent dust storms were the leading environmental factor with 52.2% share in mango orchards damages following with lack of water (40%) for irrigation. For instance, canal water was becoming highly deficit and irregular putting adverse impacts on crops and mango orchards development. Whereas less fertility of soil (7.8%) had been less effective in mango orchards damage because the soil of this area is generally very fertile.

**Table 2. Environmental factors affect mango orchards**

<i>Environmental Factors</i>	<i>Frequency</i>	<i>%</i>
Dust Storms	47	52.2
Lack of Water	36	40
Less Fertility of Soil	7	7.8

### Major Losses of Mango Growers

Due to mango orchard diseases majority of the growers were faced less profit (41.1%) and less amount of production (36.7%). Apart, marketing loss (16.7%) and transports expenditures (5.5%) further enhance their difficulties (Table 3). Therefore, their economic life badly influenced and they were troubled even to fulfill their daily needs. Aside adverse environmental factors mango orchard diseases caused significant loss to local mango growers and greatly imbalanced their social and economic life of this backward area. In this regard, possibly economic life is more important for grower's whole cycle of life because his household mainly rely on his income.

**Table 3. Major losses of mango growers**

<i>Major Losses</i>	<i>Frequency</i>	<i>%</i>
Less Profit	37	41.1
Less Production	33	36.7
Marketing Loss	15	16.7
Transport Expenditures	5	5.5

### Total Income Earned by Growers from Mango Orchard Annually

Mango orchards cultivation is a profitable activity that can bring huge returns to the growers (Bakhsh et al., 2006). But high earning of growers from mango orchard depends on good production. In study sites 26.6% growers earned the income of 100,000-200,000 PKR (Pakistani currency rupee) annually (Table 4). These were the owners of small orchards area of about one acre and less while 47.8% growers earned annual income of 200,000-400,000 PKR from mango orchards. These were also small mango growers' holdings 2-3 acres orchards area. Remaining 17.8% and 7.8% growers earned the annual income of 400,000-600,000 PKR and more than 600,000 PKR from mango orchards respectively. These were relatively large land owners of mango orchards having orchard area of 4-5 acres and above. Due to these diseases and losses they were facing lot of problems and great reduction in production. Nowadays, mangoes are getting a reasonable price not only in international market but also in local markets. Therefore, good production could enhance growers' income and brought prosperity in area on local and national level.

**Table 4. Total earned income from mango orchard and its area**

<i>Total earned income from mango orchard (PKR) and orchard area</i>	<i>Frequency</i>	<i>%</i>
100,000-200,000 (<1-1 acre)	24	26.6
200,000-400,000 (2-3 acres)	43	47.8
400,000-600,000 (4-5 acres)	16	17.8
>600,000 (>5 acres)	7	7.8

### Affected Income Limit of Growers from Mango Diseases Annually

Losses due to mango diseases mainly depended on area and production of mango orchard. Usually, most of growers faced these losses more or less. In study sites, 26.6% growers were

faced the losses of 20,000-25,000 PKR annually in their mango production (Table 5). These were small growers of mango orchards, 47.8% were faced the losses of 50,000-70,000 PKR annually. These were also ranked as small and moderate mango growers. Whereas, 17.8% and 7.8% mango growers were faced the losses of 70,000-125,000 PKR and more than 125,000 PKR respectively per year. These were the growers holding comparatively large mango orchards area.

**Table 5. Affected income of growers from mango diseases annually**

<i>Affected income of growers from mango diseases (PKR)</i>	<i>Frequency</i>	<i>%</i>
20,000-25,000	24	26.6
50,000-70,000	43	47.8
70,000-125,000	16	17.8
>125,000	7	7.8

### **Difficulties of Growers Due to Losses**

Majority of the growers faced numerous difficulties due to mango orchard diseases and their resultant losses (Table 6). Particularly, 25.6% growers were facing difficulties to manage their household properly while 23.3% were not able to fulfill their domestic and social needs. Apart, 18.9% growers were facing difficulties in the provision of sufficient food to their household, 16.6% were troubled in acquiring health and care services whereas 15.6% growers were facing difficulties to arrange education expenditures of their children. Hence, due to less production output majority of the growers have lack of money and being faced variety of problems. It is suggests that losses of mango orchards have a profound impact on growers domestic and household life.

**Table 6. Difficulties of Growers Due to Losses**

<i>Difficulties of Growers</i>	<i>Frequency</i>	<i>%</i>
Proper household running	23	25.6
Domestic and social needs	21	23.3
Provision of sufficient food	17	18.9
Acquiring health and care services	15	16.6
Children education expenditures	14	15.6

### **Alternate Source of Earning of Growers**

Due to high losses from mango production growers were unable to meet their household needs. In order to overcome these financial problems and difficulties majority of the growers (70%) have been forced to adopt alternate source of earning. These were mainly small growers whereas 30% growers that could be categorized as large growers of mango area adopt no more business. So, it is dire need to keep mango production safe from diseases and losses to enhance growers' income.

**Table 7. Alternate Source of Earning f Growers**

<i>Alternate Source of Earning</i>	<i>Frequency</i>	<i>%</i>
Yes	63	70
No	27	30

**Type of Alternate Source of Earning**

The leading alternate source of earning of growers was personal business (49.3%) of fertilizers and seeds dealing, broker ship etc. These were chiefly moderate mango growers while 26.9% growers were ran the shops of grocery items as an alternate earning source, 14.3% adopted govt. job as an alternate profession were mainly deputed in low ranked jobs of clerks, stenographer etc. Remaining 9.5% growers were involved in fruits and vegetables selling and other minor works. Hence, growers of mango orchards were been forced to engaged in other sources of earning to meet their demands.

**Table 8. Type of Alternate Source of Earning**

<i>Type of Alternate Source of Earning</i>	<i>Frequency</i>	<i>%</i>
Personal business	31	49.3
Shop	17	26.9
Govt. job	9	14.3
Other	6	9.5

**PROTECTIVE MEASURES TO MINIMIZE LOSSES OF MANGO DISEASES**

Mango orchards diseases have an immense impact on growers that faced lot of income problems due to orchard diseases and situation is not very good and satisfactory. So, it is require some effective solutions to cope up the problem on practical basis. In this regard, some protective measures were obtained from mango orchard experts and experienced mango growers in order to reduce the losses and protection against mango diseases. Among these, 21.1% were suggested that modern methods of mango plantation should be practiced, 17.8% were believed that sufficient provision of water could be lessen the mango orchards diseases, 14.5% were viewed to adopt agricultural experts opinions, 13.3% were in the favor of cut down the diseased twigs and branches of infected mango trees, 11.1% were recommended different effective sprays and fertilizers to control mango orchards diseases. This method could be very effective because some progressive growers have been successful in maintaining healthy trees with the use of potash and other balanced fertilizers because these might be helpful in controlling the mango diseases (Keerio, 2005). About 10% growers were proposed that proper distance between mango trees should be maintained while 5.6%, 4.4% and 2.2% were agreed with proper land preparation, proper cleaning of mango trees and regular monitoring of mango orchard respectively. These measures could be very handy to control on mango orchard diseases because it is found that infected trees could be destroyed the whole mango orchard (Saeed et al., 2012) and regular monitoring of orchards helps in identifying the problem and its severity (Keerio, 2005). Apart, balanced use of micronutrients i.e. zinc, copper, iron etc. also have significant effect in reduction of severity on infected plants (Masood et al., 2012). Collectively, these precautionary measures could be very

helpful and necessary for minimizing the mango orchard diseases losses because it is the identity and one of the main sources of earning of the growers of these financially backward and poverty stricken areas. Moreover, mango farming activities (managing, picking, packing etc.) provides lot of seasonal job opportunities to most of common illiterate villagers of the rural areas (Khaskheli et al., 2011) largely resided in Punjab and Sindh provinces.

**Table 9. Measures to minimize mango diseases losses**

<i>Protective Measures</i>	<i>%</i>
1. Use of modern methods of mango plantation	21.1
2. Provision of sufficient water	17.8
3. Adopt agricultural experts opinions	14.5
4. Cut down of infected twigs	13.3
5. Use of sprays and fertilizers	11.1
6. Maintaining proper distance between trees	10
7. Proper land preparation	5.6
8. Proper cleaning of mango trees	4.4
9. Regular monitoring of mango trees	2.2

## CONCLUSION

Ahmedpur East tehsil has a distinctive place in mango production in district Bahawalpur but it is confronting lot of problems i.e. mango orchard diseases. Results proved that in study area main mango orchard diseases were Die back (48.9%) and Malformation (34.5%). Frequent dust storms (52.2%) were the leading environmental factor damaging mango orchards following with lack of water (40%). Major losses of growers were less profit (41.1%), less amount of production (36.7%), marketing loss (16.7%) and transports expenditures (5.5%). Being as a main source of income 26.6% small growers earned the income of 100,000-200,000 PKR annually, 47.8% growers earned 200,000-400,000 PKR annually with orchard holdings of 2-3 acres, 17.8% (4-5 acres) and 7.8% (<5 acres) large mango growers earned the annual income of 400,000-600,000 PKR and >600,000 PKR respectively. These losses affected growers annual income greatly as 26.6% growers were faced the losses of 20,000-25,000 PKR, 47.8% were faced the losses of 50,000-70,000 PKR annually. Whereas, 17.8% and 7.8% large mango growers were faced the losses of 70,000-125,000 PKR and >125,000 PKR respectively per year. Due to these losses 25.6% growers were facing difficulties of proper household management, 23.3% were troubled to fulfill domestic and social needs, 18.9% were facing difficulties in the provision of sufficient food, 16.6% were worried in acquiring health and care services, whereas 15.6% were facing difficulties to arrange education expenditures of children. To overcome financial problems 70% growers were adopted alternate source of earning while 30% were not. Main alternate sources of earning of growers were personal business (49.3%) shops of grocery items (26.9%), low ranked govt. jobs (14.3%) and minor works (9.5%). Hence to minimize the mango losses and protection against mango diseases some experts and experienced growers suggests; use of modern methods of mango plantation, provision of sufficient water, adopt agricultural experts

opinions, cut down of infected twigs and branches, use of sprays and fertilizers, maintaining proper distance between trees, proper land preparation, proper cleaning and regular monitoring of mango trees.

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