INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 11 | ISSUE 1 | APRIL, 2018 | 115-118

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

A REVIEW

DOI : 10.15740/HAS/IJPP/11.1/115-118

A decision support system for identification of pests/disease of mango for U.P.

■ Meenakshi Malik*, A.K. Kanojia, R.V. Singh **and** Mukesh Sehgal

National Research Centre for Integrated Pest Management, **New Delhi, India**

ARITCLE INFO

Received : 17.01.2018
Accepted : 27.03.2018

KEY WORDS :
Mango, Agro-climatic zones, Decision support system, Insects/ pests

***Corresponding author:**
minaxi.2007@gmail.com

ABSTRACT

Mango described as the "king of fruits", known for its delicious taste, high nutritive value, strong aroma is a prominent horticultural crop of India. The crop grown in diverse agro-climatic conditions face differential biotic and abiotic stress limiting the production and productivity of mango. Climate change is expected to provoke the changes in diversification and abundance of arthropods, geographical and temporal distribution of insect biotypes, insect pests, herbivore plant interactions, activity and abundance of natural enemies, species extinction and efficacy of crop protection technologies which in turn will have a major bearing on food and nutritional security. Severity of mango pests is influenced both by crop growth and prevailing weather. Developing a DSS for U.P. state based on the Agro-climatic zones is an initiative that can address the above issues to some extent and facilitate sustainable mango production. The state is being covered by 9 Agro-climatic Zones. Development of databases, information systems, expert system, Decision Support System has already taken place in Indian Council of Agriculture and Research but development of Decision Support System for mango according to different Agro-climatic zones of India is not yet available. To facilitate this communication it is necessary to have a DSS of the important crop for different zones.

How to view point the article : Malik, Meenakshi, Kanojia, A.K., Singh, R.V. and Sehgal, Mukesh (2018). A decision support system for identification of pests/disease of mango for U.P. *Internat. J. Plant Protec.*, **11**(1) : 115-118, **DOI : 10.15740/HAS/IJPP/11.1/115-118**.

INTRODUCTION

Mango is prone to damage by more than 492 species of insects, 17 species of mites, 26 species of nematodes and a large number of fungal and bacterial diseases, about 45 per cent of which have been reported from India. Of all the mango insects pests, leaf hopper (*Idioscopus clypealis lethierry*), I.nitidulus, Walker and Amritodus atkinsoni, Lethierry is considered as the most widespread pest in different mango growing region of India which causes heavy damage to the mango crop (Dath and Balakrishnan, 2013). Fruit fly (*Bactrocera dorsalis, B.correctus*) is the pest which destroys the crop almost completely resulting in the complete loss. Besides, stem borer and bark eating caterpillar are also

considered as pests of major importance (Chakrabarti and Chakraborty, 2007 and Kamarudin *et al.*, 2013). Apart from the major and regular pests, incidence of thrips, leaf gall midge, red banded caterpillar and stone weevil are also causing havoc to mango farmers of this region, sometimes sporadically and many a times in epidemic way and also these pests have gained economic importance in mango recently (Chakraborty and Chakrabarti, 2008). Among the various diseases, powdery mildew is of great economic importance as it causes heavy losses in mango production. Post harvest diseases such as anthracnose, Diplodia or Botrdiplodia, Scab and *Aspergilllus* based pathogens completely ruin the harvest which ultimately affects the small and marginal farmers to a great extent (Rajan *et al.*, 2013).

Mango mall formation also results in fruit yield losses and losses due to these pests are enormous (Prasad *et al.*, 2006; Prasad and Sinha, 2002 and Yelapure and Kulkarni, 2012). Farmers resort to application of pesticide to prevent these losses and are ignorant of other method of pest control. Pesticides are applied indiscriminately resulting pesticides resistance, resurgence of pests, higher amount of pesticides residue causing environment and health hazards (Chen *et al.*, 2004; Muruganandan *et al.*, 2002 and Stoilova *et al.*, 2005). This also effect the mango export adversely (Nunez *et al.*, 2002). Developing a DSS can address the above issues and facilitate sustainable mango production. This can help farmers on variety selection, area production and productivity, field preparation, pesticides application, information about the insects/pests/diseases and their management practices (Castro and Garcia-Torres, 1995). Such tools may work as subject matter specialist to assist farmer in taking decision in critical stages of mango cultivation (Baig *et al.*, 2005).

Location specific decision support system:

Uttar Pradesh is a big state having geographical area of 2,40,928 sq.km. area with the population of 16.62 crores (census 2001). The population density is 690 per sq.km. The state has 18 Divisions and 71 districts, 312 Tehsils, 689 Town areas and 820 Blocks. The rural structure consists of 8135 Nyay Panchayat, 52,000 Gram Panchayat and 1,07,452 Villages having 2.58 Crores families. The state is being covered by 9 Agro-climatic Zones and the project proposed is based on the various Agro-climatic zones of state.

The major export varieties kesar and Alphonso are produced in Gujrat and Uttar Pradesh which top the list of mango producing states. Other major producing states are Andhra Pradesh, Maharashtra, Karnataka, Bihar and Gujarat. Uttar Pradesh is the leading mango producing state with production of 4309.54 thousand tons followed by Andhra Pradesh which has production of 2841.25 thousand tons, Karnataka 1739.64, Bihar, Gujarat and Maharashtra, respectively with 1271.62, 1125.61and 868.80 thousand tons during 2014-15. And area wise, Andhra Pradesh covers a largest area *i.e.* 315.69 thousand hectares, U.P.(276.19), Karnataka (183.46), Maharashtra (155.97), Bihar (148.37) and Gujarat (142.69).

India occupies top position among mango growing countries of the world and produces 151.88 thousand tonns of the total world production. China and Thailand stood at second and third position among mango producing countries in the world with a production of 4350 and 2600 thousand tons respectively. Fourth is Indonesia (2131.139) then Pakistan (2131.139), Mexico (1827.314), Brazil (1249.521), Bangladesh (889.176), Nigeria (850.000), Philippines (800.551) thousand tonns according to FAOSTAT database, 2014, respectively.

India exports mango to over 40 countries worldwide. The major importing countries of India's mangoes during the period of 2014-15 were UAE (29231.90), Nepal (3574.93), Bangladesh (2475.33), Saudi Arabia (2171.49), Qatar (998.10), Kuwait (787.28), Canada (669.26), Bahrain (658.71), Oman (605.20), Singapore (562.95) and 1263.16 thousand tonns to other countries.

And the major importing countries during (2015-2016) are UAE, UK, Saudi Arabia, Nepal, Kuwait, Qatar, USA, Baharain Is, Singapore, Oman, respectively with a import quantity of 19,973.60, 1,496.28, 1,399.08, 8, 273.99, 748.35, 1,016.25, 266.45, 747.79, 579.96, 426.84 million tonns.

India imports a quantity of 0.95 million tonns valuing to 0.60 lakhs from major countries Netherland (0.78 million tonns), Thailand (0.17 million tonns), Bangladesh (Nill).

Need of information sharing system:

As National Centre for Integrated Pest Management has the mandate to develop database on all aspects of crops for the pest management strategies and to give advice on related national priorities of pest

management policies. The project aims to smoothen the communication and information sharing among the different research workers and farmers in the crop. The web based DSS would timely provide the quick and correct information which can further increase the productivity and production of the agriculture crops and can help in the management of pests/diseases (Chakrabarti and Chakraborty, 2006). It can help the decision makers to gather and interpret information and build a foundation for decision making (Kumar and Chakrabarti, 1997).

Expert System is also a type of Decision Support System which helps us in taking decision (Jamsandekar and More, 2013). ICT tools in today's generation are widely used and a source of most important tool for sharing of information among the researchers and extension workers, also the farmers. Development of database, Information System, Expert System, Decision Support System has already taken place in Indian Council of Agriculture and Research but development of Decision Support System for Mango according to different Agro-climatic zones of India is not yet available. To facilitate this information sharing process, it is necessary to have a DSS for the important crops for different zones.

Impact of the developed system in agriculture :

In the last 50 years lot of research has been carried out in Agriculture field, which has not reached the farmers in a proper way. Information technology could be applied to as a means in extending the research works done by the ICAR institutes, Extension departments and SAU's. The development of "DSS for mango" will be a step forward in this direction, as it will remodel and strengthen the extension services in order to reach the farmers in a more effective way. This can also help in capturing the instant solution to the problems faced by the farmers and relief the experts, so that much time can be dedicated to more and more research.There is a growing realization to have a sound DSS of mango in the country for the different Agro-climatic zones of India as mango is one of the important crop (Khan *et al.*, 1993). It is important that the right information should reach the right time for sustainable production. As every time expert may not be available or it may be very costly to seek an expert advice.

In the past, say prior to 1950, agriculture/ horticultural production relied strongly on integrated systems and non-synthetic pesticides (Shankarnarayanan *et al.*,1979). This knowledge was put aside in the euphoria of new discoveries. The availability of new techniques such as synthetic pesticides and mineral fertilizers (Prasad and Babu, 2006 and Ghosal *et al.*, 1979.) etc enabled farmers to remunerate in a faster way for the losses in the cropping system. Hardly any research was invested in finding "softer", more environmentally-friendly and sounder production methods until the severe impact of high input agriculture on farmers, consumers and the environment became obvious.

Implementation of the system:

The developed system would be hosted on the site of National Research Centre for Integrated Pest Management. The software will also be provided in the CDs to the State Agriculture departments, Extension agencies and workers. The implementation of DSS would specifically be addressed by adopting multiple solutions. Potential end-users and stakeholders will be involved in DSS testing and implementation. The successful implementation of the system would be symbolized by the user feedback. An integrated approach, interactivity, real-time update and handy nature are the key elements for implementing the system (Mishra *et al.*, 2014). Although many Decision Support Systems (DSSs) have been developed for crop management, though have contributed little to practical agriculture because of the implementation problem.

Conclusion:

The developed system on mango would be provided to extension departments, KvKs in the CDs and training and demonstration would be provided. The developed system can help to understand the possible outcomes of the decisions and to assist them in developing plans and policies that meet their goals. These new tools will help decision makers by reducing the time and human resources required for analyzing complex alternative decisions.

REFERENCES

Baig, Fawad, Nawaz, Naima and Saif-Ur-Rahman (2005). Expert system for decision making in agriculture sector. *J. Agric. & Social Sci.*, **1813** : 2235/2005/1-2-208-211.

Castro, A.J. and Garcia-Torres (1995). SEMAGI-an expert

system for weed control decision making in sunflower. *Crop Protection*, **14** (7) : 543-548.

Chakrabarti, D. K. and Chakraborty, P. (2006). Expert system for management of malformation disease of mango. *ICAR News*, **12** (1) : 18.

Chakrabarti, D. K. and Chakraborty, P. (2007). A disease specific expert system for the Indian mango crop. *J. Agric. Edu. & Extn.*,**13** (1): 81.

Chakraborty, Pinaki and Chakrabarti, D.K. (2008). A brief survey of computerized expert systems for crop protection being used In India. *Prog. Nat. Sci.*,**18**(4): 469.

Chen, J.P., Tai, C.Y. and Chen, B.H. (2004). Improved liquid chromatographic method for determination of carotenoids in Taiwanese mango (*Mangifera Indica* L.) *J. Chromatogr. A.* **1054** : 261-268.

Dath, Ani and Balakrishnan, M. (2013). Development of an expert system for agricultural commodities. *Internat. J. Computer Sci. & Appli.* **2**(7): 75.

Ghosal, S., Chakrabarti, D. K., Biswas, D.K. and Kumar, Y. (1979). Toxic substances produced by *Fusarium*. X. concerning the malformation disease of mango. *Experientia*, **35** : 1633-1634.

Jamsandekar, P. P. and More, V. N. (2013). Agricultural extension through knowledge based expert systems. *Internat. J. Res. Computer Sci. & Inform. Technol.* (*IJRCSIT*), **1**(A): 68-71.

Khan, M. N., Nizami, S. S., Khan, M. A. and Ahmed, Z. (1993). New saponins from *Mangifera. Indica*. *J. Nat. Prod.*, **56** : 767-770 .

Kumar, R. and Chakrabarti, D. K. (1997). Assessment of loss in yield of mango (*Mangifera indica*) caused by mango malformation. *Indian J. Agric. Sci.*, **67** (3) : 130-131.

Mishra, Saket, Akankasha and Deep, Vikas (2014). Expert systems in agriculture: An overview. *Internat. J.Sci. Technol. & Engg.*, **1**(5): 45.

Muruganandan, S., Gupta, S., Kataria, M., Lal, J. and Gupta, P. K. (2002). Mangiferin protects the streptozotocin-induced oxidative damage to cardiac and renal tissues in rats. *Toxicology*, **176** : 165-173.

Nunez, A. J., Vélez Castro, H. T., Agüero-Agüero, J., Gonzalez-Gonzalez, J., Naddeo, F. and De Simone, F. (2002). Isolation and quantitative analysis of phenolic antioxidants, free sugars, and polyols from mango (*Mangifera indica* L.) stem bark aqueous decoction used in cuba as a nutritional supplement. *J. Agric. Food. Chem.*,**50** : 762-766.

Prasad, G. N. R. and Babu, A.V. (2006). A study on various expert systems in agriculture. *Georgian Electro. Scient. J. Computer Sci. & Telecommunications*, **5**(4): 81.

Prasad, Rajkishore and Sinha, A.K. (2002). Disease diagnosis of Indian mango: An expert system approach. *Japan Sci. & Technol. J. Electro.*,**11**(1): 65.

Prasad, Rajkishore, Ranjan, Kumar Rajeev and Sinha, A. K. (2006). Amrapalika: An expert system for the diagnosis of pests, *Diseases & Disorder Syst.*, **19**(1): 9.

Rajan, S., Sahu, T. K. and Yadava, L. P. (2013). Mango resources information system: An open access portrayal of phenotypical, genetic and chemical information on mango. *Acta Hort.* (ISHS), **992**: 99.

Shafinah, Kamarudin, Sahari, Noraidah, Sulaiman, Riza, Soyapi, Mohd., Yusoff, Mohd. and Ikram, Mohammad Mohd. (2013). A framework of an expert system for crop pest & disease management. *J.Theoretical & Appl. Inform. Technol.*, **58**(1): 182.

Shankarnarayanan, D. ,Gopalakrishman, C., Kameswaran, L. and Arumugum, S. (1979). The effect of mangostin, mangostin-3, 6-di-O-glucoside and mangiferin in carbon tetrachloride liver injury. *Mediscope.*, **22** : 65.

Stoilova, I., Gargova, S. and Stoyanova, A. (2005). Antimicrobial and antioxidant activity of the polyphenol mangiferin. *Herb Polonica.*, **51**: 37-44.

Yelapure, S. J. and Kulkarni, R. V. (2012). Literature review on expert system in agriculture. *Internat. J. Computer Sci. & Inform. Technol.*, **3** (5): 5086.