Technology Notes

Himalayan Phytopathological Society

(Registration No. PSH/16/892/2018)

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VOL. 3 No. 1 (January-June) 2020

From the Vice Chancellor's Desk

As we are ushering in the New Year, it is time to cheer as we have timely rain and snow in December which is a good omen for the horticulture industry of the State. With this issue of Technology Notes, it is time to connect to our farming community and all other stakeholders. As plant health is the main focus of this magazine, the year 2020 is of great significance as United Nations has declared this year as International Year of Plant Health (IYPH) with an aim to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development. It is reported that every year, up to 40 percent of global food crops are lost to plant pests and diseases. Plant health management is of prime importance in Himachal Pradesh also as agriculture is the main occupation of majority of population of the State. In addition, we have treasure of forest wealth which also needs scientific management for its good health and regeneration. As institution of core competence in the area of horticulture and forestry for more than 50 years, we always kept hawks' eyes on all the issues related to plant health. We have developed disease and pest management technology modules for all the important commercial crops grown in the State. Successful management of apple scab in 2019 is the testimony of our technology backup and preparedness of our extension agencies to contain such problems. But, in this year of Plant Health, we need to see it in the context of overall health of human beings and the environment. There is need for more research and emphasis on eco-friendly technologies of plant health management. Nature has given us plenty of plant species, beneficial insects and microbial resources which can be used effectively to manage diseases and pests. There is need for mass campaign to equip the individual farmers with capabilities to make use of these native resources for the management of diseases and pests in their crops. I wish that every farmer, scientist and policy maker who is concerned with plant health will help in further strengthening our resolve for better plant health during the year 2020.

Dr. Parvinder Kaushal

International Year of Plant Health-2020-An attempt to safeguard agriculture and environment

Dr H.R. Gautam
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Plants are the most important resource on the earth to sustain life as they make up 80% of the food we eat, and produce 98% of the oxygen we breathe. Plants are under constant and increasing threat from pests and diseases posing a serious threat on food security of the world. Every year, up to 40% of global food crops are lost to plant pests and diseases. According to Food and Agriculture Organization (FAO), trade in agricultural products is worth $1.1 trillion annually, but pests cause losses of around $220 billion a year. In our food basket, wheat, rice, maize, potato and soybean contribute 18.3, 18.9, 5.4, 2.2 and 3.3% of the global human calorie intake (2013 estimates), respectively. Based on the synthesis of the responses, combined with national yield statistics, led to global crop loss estimates due to diseases and pests on wheat, rice, maize, potato and soybean are to the tune of 21.5, 30.0, 22.6, 17.2 and 21.4%, respectively. In 2011, The International Maize and Wheat Improvement Centre predicted that a mysterious disease known as wheat blast could devastate South Asia. In 2016, the disease struck seven districts of Bangladesh, killing all crops in some areas. Over a billion people in Bangladesh rely on wheat as a staple crop, and the crop is grown on 13 million hectares of land. Conservative estimates put losses at between $180 and $350 million in South Asia.According to estimates, Ug99 race of the stem rust can result in up to 10% yield loss in Asia alone,

Guest editors of the issue: Dr. Narender K. Bharat and Dr. H.R. Gautam

amounting to US$ 1–2 billion per year. Similarly, banana wilt caused by *Xanthomonas* affects the food security of 70 million people in Uganda. In potato, economic production is often impossible without the application of pesticides. Late blight of potato caused by *P. infestans*, is considered to be the most economically important disease of potato worldwide. The disease can destroy a potato crop within a few weeks. Estimates of losses to late blight in developing countries vary between US$ 3 and US$ 10 billion each year, and about US$ 750 million is spent on pesticides alone. The bacteria *Xylella fastidiosa*, for example, has travelled from the USA to France, Italy and Spain, wreaking havoc on vineyards and olive groves. It has no cure and has had a catastrophic impact overseas; it's infected more than 200 million citrus trees in Brazil. Once *X. fastidiosa* infiltrates a plant, it is there to stay - it starves the plant of water until the plant dies or becomes too weak to grow fruit. *X. fastidiosa* costs $104 million per year in wine losses in California alone. In Italy, the bacteria has led to the decline of 180,000 hectares of olive groves - many centuries-old trees - and constitutes a threat not only to Italy's economy but to all Mediterranean countries' economy. Panama wilt caused by *Fusarium oxysporum* f. sp. *cubense* is a serious disease of banana which result in huge losses across the globe. Losses due to the *Fusarium* Tropical race 4 fungus have been estimated amounting to US$121 million in Indonesia, US$253.3 million in Taiwan, and US$14.1 million in Malaysia. In rice, blast caused by *Magnaporthe* (*Pyricularia*) *oryzae* is resulting in losses of 10– 30 per cent of the crop every year. Grey mould (*Botrytis cinerea*) can infect more than 200 plant species which consume a huge cost world over to save the crops from this pathogen.

Protection of plant health is essential to the survival of humans and animals on earth. Further, other living beings are also inextricably dependent upon this process, whether they are herbivores, carnivores, parasites, scavengers, or decomposers. United Nations has declared 2020 as International Year of Plant Health (IYPH) with an aim to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development. FAO formally launched the programmes to mark the year and its International Plant Protection Convention (IPPC) will lead activities to make the Year a success as well as promote plant health beyond 2020. On the launch ceremony of the FAO, UN Secretary-General- António Guterres has a terse message to the global community to dedicate the necessary resources and to increase our commitment to plant health.

Invasive pathogens and pests are one of the most important cause and concern for the safety of the crops world over. There are numerous examples where the trans-boundary diseases and pests have caused havoc on crops of commercial importance affecting the livelihood of millions of people. Commission on Phytosanitary Measures is the governing body of the International Plant Protection Convention (IPPC) which is the only international body authorized with setting and implementing phytosanitary standards recognized by governments around the world and the World Trade Organization-SPS agreement is to facilitate safe trade and protect plant health. Invasive plant pathogens can be prevented by better plant health infrastructure, better plant health legislation and better international cooperation and information policies. Instead of spending hundreds of millions of dollars on combating introduced pests, we should be spending a fraction of these resources on establishing proper systems to prevent their introduction in the first place. That is the essence of the International Year of Plant Health, and that is our goal. CABI has received a US $200,000 grant from the Grand Challenges program, an initiative of the Bill & Melinda Gates Foundation, to begin an ambitious undertaking to capture and measure the global impacts of crop pests and diseases with the ultimate aim of helping to improve global food security.

The emerging threats of plant pathogens can be managed with the infusion of new technologies. We need to develop sensing and detection devices for pathogens and use these devices in combination with robotics to deliver devices to the field.Artificial intelligence-powered tools are rapidly becoming more accessible and can an important role in disease diagnosis for effective management of diseases. A new smart phone tool developed for banana farmers scans plants for signs of five major diseases and one common pest. In testing in Colombia, the Democratic Republic of the Congo, India, Benin, China, and Uganda, the tool provided a 90% successful detection rate. This work is a step towards creating a satellite-powered, globally connected network to control disease and pest outbreaks, say the researchers who developed the technology. Researchers at North Carolina State University have published an exciting study on a novel technology which allows farmers and extension workers to identify plant diseases remotely in the field

using airborne chemical fingerprints. The newly developed handheld sensory device, which can be plugged into a smartphone, samples the airborne levels of volatile organic compounds (VOCs) that are released by plants from the leaves.Each disease has its own signature profile of VOCs. The device correctly identified the late blight pathogen (Phytophthora infestans) on tomato leaves and The tool was also able to distinguish the blight pathogen from two other major fungal pathogens that produce similar symptoms on tomato crops with over 95% accuracy.

Biotechnology is another potential area where the techniques and tools for identification of diseases need to be fine tuned and affordable to the level of field kits. Genome editing has been successfully deployed to engineer crops with increased resistance to bacteria and fungi. For example, genome editing was used to improve plant disease resistance in rice to thwart bacterial blight (*Xanthomonas oryzae*) which is a devastating disease that affects millions of hectares throughout the world. Another example of using genome editing to confer disease resistance involved modifying the wheat genome to confer resistance to powdery mildew (*Blumeria graminis* f. sp. *tritici*) in wheat. Climate change is another threat which is looming large on the plant health and in order to combat the ill-effects of changing climate, we need to develop new geospatial analytic tools to monitor "real-time" disease emergence, sources of outbreaks and spread using "big data" mining tools and mathematical modelling.

Farmers friendly Guidelines for Management of Citrus Greening

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Among all graft transmissible pathogens, Citrus greening (HLB, Huanglongbin) disease, singly or as a mixed infection with pathogens, play a significant role in causing citrus decline in India. It is caused by *Candidatus Liberibacter asiaticus* (CLa) a phloem-limited, uncultured bacterium that are widely prevalent in moderate to severe form in all citrus growing belts.The bacterium is disseminated by budding and grafting in the nursery as well as by citrus psylla, *Diaphorina citri* in a citrus grove. Yellow shoots , blotchy mottle symptoms on leaf , twig dieback, zinc deficiency like symptoms on leaves, small misshape fruits with abortive seeds and improper colour development of matured fruits are some of the characteristic symptoms of this disease. Different sensitive molecular diagnostic tools*viz.* PCR, Real time PCR, LAMP etc. have been developed for rapid and reliable detection of the pathogen in plant samples and in psyllid vector. These standardized diagnostic techniques have been successfully utilized in implementing citrus budwood certification program for indexing (testing)candidate trees (mother plants) that act as source of scion material in nursery and finally to produce disease-free planting material of citrus for the citrus growers. Practically there is no treatment to cure citrus trees once it is infected by this systemic pathogen. Application of antibiotics is not practical for field use against prokaryotic disease like greening. Therefore management options are limited to pathogen-free planting material, control of insect vector, use of disease tolerant and resistant cultivars and reduction of inoculums by proper disease diagnosis and destruction of infected trees.

- The most important step management practise includes use of certified pathogen-free planting materialfor new orchard establishment as it will ensure orchards of better longevity and higher productivity.
- Introduction of infected planting material to newer areas should be stopped.
- After proper identification infected plants or plant parts need to be destroyed as it effectively reduce the pathogen load from the field.
- Pruning/cutting tools that are used on infected trees in the field should be decontaminated with freshly prepared 1-2% sodium hypochlorite solution (Active ingredient is house hold bleach). These tools can be decontaminated by wiping or dipping in the solution for few minutes.
- Since the pathogen spread in the field by insect vectorcitruspsylla, chemical or biological control of the insect vectors may be effective to minimize disease spread in the field. Soil application of confider @ 1 mi/lit of water 15-20 days before new flush and foliar application (0.5 ml/ lit) during flush at 20 days interval can protect entire spring flush from these insect vectors
- Recommended doses of NPK and various micronutrients (viz. $ZnSO_4$, $FeSO_4$ and $MnSO_4$)should be routinely applied every year either by foliar spray or soil application as it helps in improved plant health and its defence against pathogen infection.

- Intercropping of guava plant within citrus orchards act as repellent (due to release of volatile Sulphur compound) for citrus psyllawhich subsequently results in reduced spread of citrus greening disease.
- Collateral / alternate host (Muraya plant/ curry leaf) existing near to citrus orchards that harbours citruspsylladuring off season, need to be removed.
- Clean cultivations and removal of wild citrus species as well as weeds mechanically or by application of herbicides which otherwise may harbour pathogens and /or insect vectors inside the citrus orchard
- Plant parts (branches) showing initial symptoms of citrus greening should be removed to reduce the inoculums load from the infected plant.
- Regular application of recommended doses of chemical fertilizers (both macro and micronutrients) and manures will ensure the improved plant health and tolerance to pathogen infection in field condition

Fig. 1. Different types of greening symptoms

Fig. 2. Greening symptoms on Kinnow fruits

Fig. 3. Disinfection of pruning tolls either by dipping or by wiping with 1-2 % Sodium hypochlorite solution

Powdery mildew and Black banded disease - most important diseases of mango and their management

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Powdery mildew

Powdery mildew of mango caused by *Oidium mangiferae* Berthet is a widespread and most important disease of mango. The disease is known to cause extensive damage mainly up to latitude 40^{o}NS of the Equator. In India, the disease is present in almost all the states of the country including hill valleys and plains and from north to south and east to west.

In some places the blossom infection is serious, while in others foliar infection is more common. Foliar, blossom and fruit infections are caused by this disease, but blossom infection is most serious and is responsible for yield loss up to 90%. It affects fruit set and causes fruit drop, resulting heavy yield loss. It is essential to control the disease by suitable fungicides otherwise it harms the crop heavily. In India, incidence of mildew has assumed such a devastating proportion that during epidemic year crop is completely destroyed, if proper control measures are not adopted.

Symptoms

The symptoms of the disease can be noticed on the inflorescence, stalk of the inflorescence, leaves and young fruits. The characteristic symptom of the disease is the white superficial powdery growth of the fungus on these parts having millions of conidia, which are borne in chains on conidiophores. Mildew pathogen attacks flowers, resulting in white superficial powdery growth of the fungus on the inflorescence resulting in it's shedding. Dropping of unfertilized infected flowers leads to serious crop loss. Young fruits are covered entirely by the white mildew. When it grows, epidermis of the infected fruits cracks and corky tissues are formed. Infection is frequently noticed on young leaves, when their colour changes from brown to light green. Young leaves are attacked on both the sides as small irregular grayish patches, but on the underside, the symptoms are generally more conspicuous. Often, these patches coalesce and occupy larger areas turning into purplish brown in colour. The pathogen is frequently restricted to the area of the central and lateral veins of infected leaves and such leaves often twist, curl and get distorted. Recently, it has been observed that while distortion of leaves is more common in plains, in the foothill areas, it shows ashy brown patches with white powdery growth on the leaf surface.

Powdery mildew inflorescence infection

Powdery mildew new leaf infection

Powdery mildew leaf infection

Powdery mildew fruit infection

Integrated management

Pruning of diseased leaves and malformed panicles reduce primary inoculum load. As the inflorescence infection causes actual serious harm, 3 sprays of fungicides during a flowering season is recommended at 15-20 days interval. Although several fungicides are found effective against powdery mildew of mango but most effective schedule developed at CISH, Lucknow is as follows.

Three sprays of fungicides are recommended during a flowering season but these are need based. As the disease is climate dependent, it is required to use the chemicals only need based.

- First spray of wettablesulphur (2 g per liter of water) before opening of flower (when panicles are 10-15 cm size).
- Second and third spray of hexaconazole (4%) + zineb (68%) or hexaconazole (5%) @ 1 g or 1 ml per liter of water) should be done at 15-20 days interval after 1st spray.

As the disease spread by wind, high wind velocity for 3-4 days with maximum temperature around 35^{0}C, minimum temperature around 15^{0}C, relative humidity of minimum 23.4-25.5 % and maximum 73.3-83.9 % are conducive for the rapid spread of the disease. It is further revealed that maximum temperature of 35^{0}C play crucial role in the epidemic of PM.

Black Banded Disease

The occurrence of the disease on mango plant is reported from several parts of the country. It is common disease and caused by RhinocladiumcorticolumMassee.

Black velvety fungal growth develop on the bark of twigs and branches of mango. It also occur on leaves. The incidence is comparatively lower on main trunk. It presents a characteristic and conspicuous black banded appearance (Fig.) and so the name black banded is given. The mycelial growth and clusters of conidiophores present a velvety appearance during rainy season which drop off in summer months leaving light black bands on the affected portions. The fungus remains confined to the upper layer of the bark.

Disease Management:

The affected portion is rubbed by gunny bags/cloth, which removes the fungal growth on the affected portion. After this, application of Bordeaux paste or spray of Bordeaux mixture (5:5:50) or copper oxychloride (3g/litre of water) control the disease. The application of Bordeaux paste or Bordeaux mixture (5:5:50) or copper oxychloride (3g/litre of water)can be repeated, if the disease is not checked by single application.

Black banded on twigs

Black banded on leaves

मटर की प्रमुख बिमारियां एवं उनके प्रबन्धन

डॉ डी. के. बन्याल, अनुदीप व माहण्णवर एवं आ ामा ठाकुर
पादप रोग विज्ञान विभाग
चौधरी सरवण कुमार कषि वि वविद्यालय पालमपुर

1. चूर्णा सिता रोग (ऐरिसिफी पाइसी): –

लक्षण: –

- यह रोग ठंड और ुष्क मौसम में होता है।
- रोग के पहले लक्षण पुराने पत्तों पर सफेद धब्बों के रूप में उभरते हैं।

- ये धब्बे क्रम से पूरे पौधो पर फैलतें हैं और सारे पौधो को सफेद फफूंद से ढक देते है।
- रोग की तीव्रता बढ़ने पर फल की मात्र एवं गुणवत्ता में भी काफी गिरावट आती है।

रोकथाम: –

- रोग प्रति रोधी किस्मों का प्रयोग करें। (पालम प्रिया एवं पी. बी. – 29)।
- जल्दी तैयार होने वाली किस्मों में यह रोग कम आता है।
- खेत में सफाई रखें और रोग ग्रस्त पौधों को जला दें।
- बीमारी आने पर फसल में हैक्साकोनाजोल (सितार/कन्टॉफ 1 मि. ली/लीटर पानी) टेबूकोनाजोल (फोलिकर 0.5 मि.ली/लीटर पानी) या वैलेटान (1 ग्राम/लीटर पानी) या कैराथेन (0.5 मि. ली/लीटर पानी) का 10 – 15 दिन के अन्तर पर 4 – 5 छिड़काव करें।

2. जड़ सड़न रोग (फ्यूजेरियम ऑक्सीस्पोरम):

लक्षण: –

- पौधो के नीचे की पत्तियों का पीला पड़ना और जमीन की तरफ मुरझाना इस रोग का प्रमुख लक्षण है।
- यह लक्षण पूरे पौधो पर फैल जाते हैं एवं पौधा वृद्धि रोधी दिखाता है और पत्ते पीले होकर अंदर की ओर मुड़ जाते हैं।
- धीरे से यह रोग पूरे पौधो को नीचे गिरा देती है।
- पौधो की संवहनी प्रणाली पीले रंग में दिखाई देती है।

रोग की तीव्रता से पौधों की जड़े सड़ जाती है तथा पौधा मर जाता है।

रोकथाम: –

- अधिक सक्रंमित क्षेत्रें में जल्दी बुआई न करें।
- सक्रंमित क्षेत्रें में तीन वर्षीय फसल चक्र अपनाऐं।
- बीज को बैविस्टन या कैप्टॉन (2.5 ग्राम प्रति कि.ग्रा. बीज) से उपचार करें या बीज को ट्राईकोडर्मा विरिडी (10 ग्राम/कि.ग्रा. बीज और मिट्टी को 10 ग्राम प्रति लीटर पानी) से उपचार करें।

3.सफेद सड़न रोग (स्कलेरोटिनिया स्कलेरोसियारम)

लक्षण: –

- यह रोग पौधो के किसी भी चरण में आ सकता है।
- पौधो के सारे भाग इस रोग से ग्रसित हो सकते है, पर फूल और फलियां भरते समय रोग की ज्यादा तीव्रता दिखाई देती है।
- पौधो के कई हिस्सों पर जल स्क्ति धब्बे बनते है और यह धब्बे धीरे से बढ़ने लगते हैं।
- रोग के बढ़ने के साथ – साथ यह फफूंद इन धब्बो पर सफेद वृद्धि दिखाता है और तने को भी ग्रसित कर देता है।
- बाद में यह फफूंद संक्रमित तनों पर काले रंग का कडा स्कलरोशियम बनाती है जिस से पौधा मुरझा जाता है और मर जाता है।

रोकथाम: –

- फसल की कटाई के बाद पौधों के अवशेषों को जला दें।
- क्तारों व पौधों के बीच सही अन्तर रखें।
- बीज को बैविस्टन (2.5 ग्राम/कि. ग्रा. बीज) या ट्राईकोडर्मा विरिडे (10 ग्राम/कि.ग्रा. बीज) से उपचार करें।
- फूल आने की आवस्था के बाद बैविस्टन (1.0 ग्राम प्रति लीटर) से छिड़काव करें।

4. एस्कोकाईटा ब्लाईट (एस्कोकाईटा पाईसी)

लक्षण: –

- पत्तों पर गोल या अनियमित आकार और हल्के भूरे रंग की चित्तियां दिखाई पड़ती है
- तनों के उपर लम्बी चित्तियां भूरे या काले रंग में बदल जाती है।
- ये चित्तियां फलियों पर भी फैल जाती है और फलियों पर काले किनारे युक्त अनियमित आकार की धंसी हुई चित्तियां नजर आने लगती हैं।
- बीज में पहले से फफूंद के सक्रमण होने से पौधे बीजांकुर के समय मर जाते है।

रोकथाम: –

- स्वस्थ बीजों का उपयोग करें।
- बीज को बैविस्टन (2.5 ग्राम/कि.ग्रा. बीज) से उपचार करें।
- बिमारी के लक्षण दिखने पर बैविस्टन (1 ग्राम/लीटर पानी) या मैनकोजैव (2.5 ग्राम/लीटर पानी)का 10 – 15 दिन के अंतराल पर 4 – 5 बार छिड़काव करें।

5. बैक्टीरीयल ब्लाईट (प्सूडोमोनास सिरिंजै): –

लक्षण: –

- पत्तों के उपर अनियमित आकार और भूरे रंग के धब्बे बनते है।

- फूल की पँखुड़ी का भाग ग्रसित होने पर पत्ते और फूल गिर जाते हैं।
- ज्यादा नमी के समय काले रंग की लकीरें तनों पर भी दिखाई देती है और समय के साथ ये पूरे तने पर फैल जाती हैं और पौधा मुरझा के मर जाता है।

रोकथाम: –

- रोग ग्रस्त भागों को एकत्रित करके जला दें।
- तीन वर्षीय फसल चक्र अपनायें।
- जल निकासी का उचित प्रबंध करे ताकि नमी सही स्तर पर बनी रहे।
- स्वस्थ बीज का प्रयोग करें। बीज को स्ट्रैप्टोसाइकलिन के घोल (100 पी.पी.एम.) या प्सूडोमोनास फ्लोरासैन्स (10 ग्राम/कि.गा.) में 2 घण्टे तक शोषित करें। बाद में इन्हीं के घोल का 7 दिन बाद फिर छिड़काव करें।

6. मटर का रतुआ रोग: – यूरोमाईसिस पाइसी

लक्षण: –

- रोग के प्रारंभिक लक्षण में पौधो के हरे भागों पर पीले, गोल या लंबे धब्बे समूहों में पाये जाते हैं।
- बाद में ये धब्बे भूरे रंग में परिवर्तित हो जाते हैं।
- गंभीर रूप से ग्रसित पत्ते सूख जाते हैं और अंत में गिर जाते हैं।
- रोग तने एवं डंठल पर भी जाता है।
- अनुकुल स्थिति में पूरा पौधा मर जाता है।
- यह रोग नम जलवायु वाले क्षेत्रें में अधिक उग्रता से उत्पन्न होता है।

रोकथाम: –

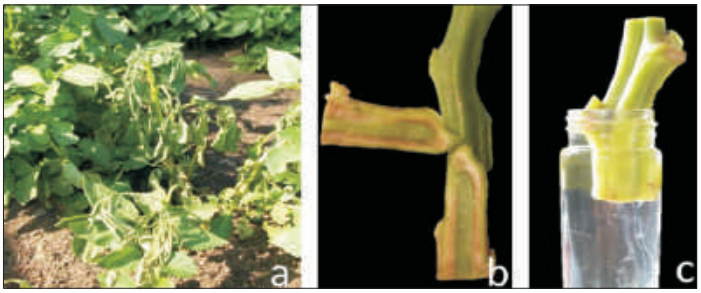
- 1–2 वर्ष तक फसल चक्र अपनाना चाहिए।
- खेत की सफाई रखें एवं बीज रोग रहित क्षेत्र से ही उपयोग करें।
- कटाई के बाद संक्रमित पौधों को जला दें।
- बीमारी के लक्षण दिखने पर फसल पर डाईथेन जैड़- 78, प्रोपीकॉनाजोल या डाईफैनोकॉनाजोल (1 मि.ली./ लीटर पानी) या टेबुकोनाजोल (1 मि.ली./लीटर पानी) का छिड़काव करें।

आलू का शाकाणु मुर्झान व भूरा गलन रोग

डॉ. विनय सागर, प्रधान वैज्ञानिक
पौध संरक्षण संभाग, भा. कृ. अ. प. – केन्द्रीय आलू अनुसंधान संस्थान, शिमला – 171 001 (हि.प्र.)

शाकाणु/ भूरा गलन आलू के सबसे हानिकारक रोगों में से एक है। इस रोग द्वारा फसल का 30 – 70 प्रतिशत तक नुकसान हो सकता है। इस रोग का प्रकोप उत्तर पश्चिम के राजस्थान, पजाब, हरियाणा तथा उत्तर प्रदेश के उत्तर मध्य मैदानी क्षेत्रों को छोड़कर देश के समस्त आलू उत्पादक क्षेत्रों में होता है। इस बीमारी के कारण खड़ी फसल में पौधे मुर्झा जाते हैं और इससे संक्रमित कंद खेत, भंण्डारण और परिवहन के दौरान सड़ जाते है। रोग के प्रारम्भिक लक्षणों में पौधे की उपरी शाखाओं की पत्तियां मुर्झा जाती है। और ऐसा प्रतीत होता है कि पौधों में पानी की कमी है। ये लक्षण दोपहर के समय धूप में और भीस्पष्ट दिखते है। बाद में पूरा पौधा मुर्झा जाता है। खेत में रोग कि पहचान आसानी से की जा सकती है। इसके लिए काँच के गिलास में साफ पानी लें। अब उसमें रोगग्रस्त पौधे का 4 – 6 सें. मी. लंबा तना सतह से काटकर निचली सतह कि तरफ से पानी में डुबाएं तथा 2 – 3 मिनट तक बिना हिलाये डुलाये रहने दे जैसा कि चित्र में दर्शाया गया है। अगर पौधा शाकाणु मुर्झान रोग से ग्रस्त है तो कुछ ही समय में तने के सिरे से दुधिया रंग का पदार्थ धागे की शक्ल में निकलना शुरू हो जाएगा तथा सारा पानी गंदला हो जाएगा। इस परीक्षण से कन्दों में भी इस रोग कि पहचान की जा सकती है।

कंदों में भी इस रोग के लक्षण दिखाई देते है। रोगग्रस्त कन्दों को काटने पर उनके संवहनी उतक पानी से भीगे भूरे रंग के दायरे जैसे दिखते है। कुछ ही समय में इन दायरों पर दूधिया रंग कि चिपचिपी बूंदें उभर आती है जो कि जीवाणु पुंज है। रोग की आगामी अवस्था में कन्दों की आँखों से भी जीवाणु पुंज का स्त्राव हो सकता है।



पौधे में शाकाणु मुर्झान के लक्षण (a), तने की संवहनी अत्तकों का भूरापन (b) व रोगग्रस्त तने से पानी में दुधिया पदार्थ का स्त्राव (c)

कंद के संवहनी उत्तकों को भूरापन व शाकाणु पुंज का स्त्राव (बाऐं) तथा आलू की आंख से शाकाणु पुंज का स्त्राव

यह रोग एक जीवाणु रालस्टोनिया सोलानेसीयरम (*Ralstonia solanacearum*) के कारण होता है। रोगजनक घावों के माध्यम से स्वस्थ पौधों की जड़ों को संक्रमित करता है। संक्रमित कंद और मिट्टी में सक्रमित पौधों का मलबा इस रोग के दो प्रमुख स्त्रोत है। साधारणत मिट्टी का तापमान 15° सेल्सिय से नीचे या 35° सेल्सिय से उपर होने पर इस रोग की वृद्वि रूक जाती है। मिट्टी की अधिक नमी जीवाणुओं के जीवित रहने की अवधि सक्रंमण की क्षमता रोग की विकास दर व ग्रस्त पौधों से जीवाणुओं के बाहर निकलने और मिट्टी के माध्यम से फैलने की दर को बढ़ाने में सहायक होती हैं इस रोग के जीवाणु विभिन्न प्रकार की मिट्टी व अम्लता के स्तर पर भूरा

गलन व मुर्झान पैदा करने में सक्षम है। अधिकांश मामलों में रोग अमलीय मिट्टी (पी एच 4.3 से 6.8) मे और केवल कुछ मामलों में क्षाररीय मिटटी में देखा गया है। कई बार रोग ग्रस्त क्षेत्रों में उत्पादित बीज उपर से रोग का बहुत बुरा प्रभाव पड़ता है। इस रोग के जीवाणु कई प्रकार की घास- पात तथा खेत में ही छूट गए रोगी कन्दों पौधों की जड़ों व बेलों में पनपते रहते है।

रोग प्रबंधन

क्योंकि यह रोग बीज और मिट्टी जनित है। अत: पूर्ण नियंत्रण पाना मुश्किल है, फिर भी निम्नलिखित पर्यावरण अनुकूल साधनों का उपयोग करके निश्चित रूप से अर्थिक नुकसान कम किए जा सकते है। स्वस्थ बीज स्वस्थ बीज का उपयोग लगभग 80 प्रतिशत तक शाकाणु मुर्झान की समस्या को कम कर सकता है। अत: बीज हमेशा उन क्षेत्रों से प्राप्त करें जो इस रोग से मुक्त हो। हिमाचल में 2200 मी. से अधिक ऊँचाई वाले क्षेत्र भारत में पश्चिम तथा मध्य सिंधु गंगा के मैदानी इलाके इस रोग से मुक्त है। बीज को काटकर नहीं लगाना चाहिए क्योंकि बीज काटकर लगाने से अगर बीज ग्रसित होगा तो जिस चाकू या छूरी से बीज काटा गया है उस से भी रोग अन्य स्वस्थ कन्दों में फैल सकता है। अगर खेत पहले से ही ग्रसित है तो रोग के प्रभाव को कम करने के लिए निम्न कृषि कियाओं का पालन करें। उचित फसल चक्र मक्का, अनाज, लहसुन, प्याज, गोभी, आदि फसलों का उपयोग करके 2 - 3 वर्षीय फसल चक्र अपनाएं आलू की फसल के साथ कभी भी बैगन, अदरक, मिर्च,शिमला मिर्च आदि फसलों को फसल चक्र में न अपनाएं। धान, गन्ना हालांकि रोगकारक के पोषी नहीं है। फिर भी वे रोगजनक के वाहक होने के कारण बीमरी के प्रसार में योगदान करते है।

बिजाई के पश्चात कम से कम कृषि क्रियाएं करें:

निराई - गुडाई के दौरान पूरी सावधानी बरतने के उपरान्त भी पौधों की जड़ें व डंठल चोट ग्रसित हो जाते है जहां से रोगकारक आसानी से पौधों को सवंमित कर सकते है। अत: जितना सम्भव हो सके निराई गुडाई जैसी कृषि क्रियाएं कम से कम करें। अधिक उचित यही होगा अगर बीजाई के दौरान ही मिट्टी चढ़ाने का कार्य भी पूरा कर लिया जाए।

फसल खुदाई के बाद खेत की देखभाल:

इस रोग के जीवाणु घासपात / खरपतवार या मिट्टी में गहरी दबी ग्रसित जड़ों में जीवित रह सकते है। अत: सबसे पहले खेत से खरपतवारों तथा जड़ों व पतियों के अवशेषों को निकालकर जला दें। गहरी जुताई द्वारा अवशेष व रोग कारक बाहर आ जाते है। मैदानी व पठारी इलाकों के 40° से अधिक तापमान तथा पहाडी क्षेत्रों के 5 से कम तापमान में खेत की गहरी जुताई कर खुला रखने से रोग कारक बहुत हद तक कम हो जाते है।

रासायनिक उपाय:

फसल बीजाई के समय प्रति हैक्टर 12 किलोग्राम की दर से ब्लीचिंग पाउडर का प्रयोग उर्वरकों के साथ गूलों में करने से रोगकारकों पर नियंत्रण पाया जा सकता है।

Emerging Canker Problems in Apple Orchards

Dr. D.P. Bhandari
Regional Horticultural Research and Training Station, Sharbo (Kinnaur) H.P.

Canker is a localized necrotic lesions/area usually surrounded by callus. Canker fungi manifests different type of symptom in plants. Injury/cuts on stem and branches usually aggravate the disease. Dark brown to black lesion develop on stemand branches of the tree exhibiting brown papery bark which can be easily peeled off. In Himachal Pradesh, thirteen different cankers have been reported so far whereas fivenamely; smoky blight, (*Sphaeropsis malorum*), stem brown (*Botryosphaeria dothidea*), stem black (*Coniothecium chomatosporum*), perennial canker (*Cryptosporiopsis perennas*) and *Cytospora canker*(*Cytospora sp.*) are found most prevalent in dry temperate region of district Kinnaur. Anthracnose canker (*Cryptosporiopsis melicortis*) and *Cytospora canker* (*Cytospora sp.*) are two new emerging canker fungi reported to cause disease in district. The canker usually develops in high humid area with low to moderate temperature and sometime kills whole tree. All types of canker fungi generally disperse from one place to another through wind/water borne conidia that splashes during rains. Canker fungi proliferate through wounds made after pruning, harvesting, insect damage and even though intact bark. Problem of canker is still persisting in all apple growing areas of Himachal Pradesh. Smoky blight canker (36.8%) and stem brown canker (39.65%) are more prevalent in Nesang, Ribba, Spillow, Murang and Nako villages of development block Pooh whereas its incidence is low to moderate in Kalpa and Nichar block. Due to less technical proficiency about perennial (32.81%), anthracnose (18.43%) and cytospora canker (26.21%), less preventive measures are being adopted to tackle these problem hence the incidence of these three cankers are still increasing in the district.

Main reason of canker

- Commencement of stress condition due to improper fertigation and irrigation
- Non adoption of fungicides especially on non - bearing fruit trees
- Painting without proper scarification of bark/branch upto the cambium region.

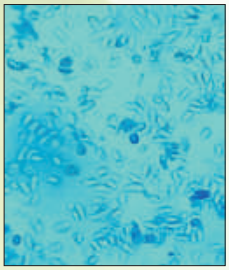
Management of canker

- Burning / removal of fully infected branch or stem
- Spray of copper oxychloride @ 600g/200 lt water after fruit harvest
- Spray of bavistin/blitox after pruning

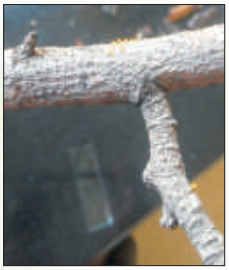
- Proper fertigation and sanitation in orchard
- Application of Chaubattia paste (Red lead: copper carbonate: linseed oil 1:1:1.25) /Bordeaux paste on stem.
- Spray of systemic insecticide along with fungicide in complex situations
- Scarification of dead bark upto green portion and application of white paint (1lt) + Carbendazim (10g/lt paint) during winter provides maximum wound recovery. It will also protect both from rain as well as snow.
- Spray of Carbendazim (100g/200lt water) or Copper oxychloride (600g/200lt water) after fruit harvest and before bud burst.

Oozing of cell sap from affected portion

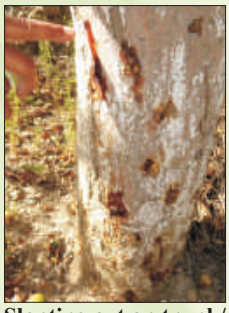
Sporulation of *Cryptosporiopsis* sp.



Conidia of *Cryptosporiopsis* sp.

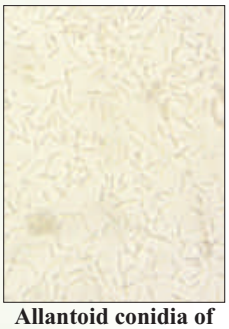


Cytospora canker with yellow oozing of conidia tendril through ostiole



Slanting cut on trunk/ branches with ooze is complex problem associated with stem borer and canker fungi

Acervuli of anthracnose canker



Allantoid conidia of anthracnose fungi

Scarify canker portion upto green part and apply white paint +10g bavistin in winter

Wound recovery after one year of treatment

Survival of fruit tree

TECHNOLOGY STRIDES

Production Technology of Oyster Mushroom for Cold Desert Regions of Himalayas

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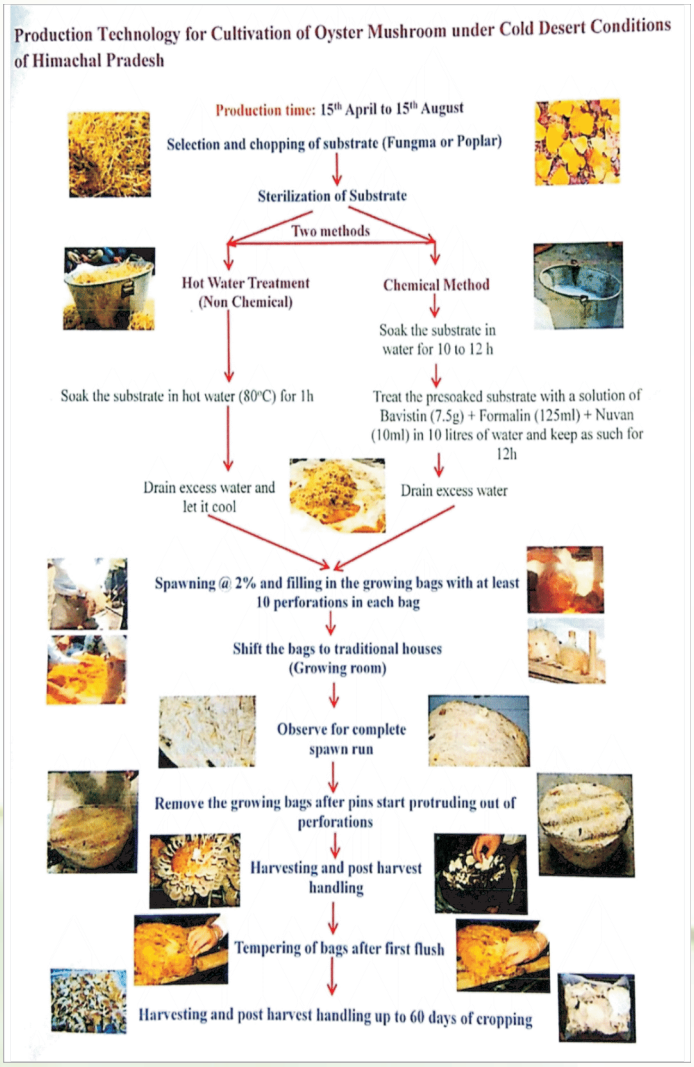
College of Horticulture and Forestry
Neri, Hamirpur – 177 001 (H P)

A production technology was devised for the cultivation of *Pleurotus. sajor-caju* under dry temperate conditions of Himachal Pradesh by using locally available plant materials viz. fungma or poplar as substrates. These studies were conducted under a DST funded project at Regional Horticultural Research SubStation, Tabo, LahaulSpiti during 2013-2016. The local tribes were also trained for the cultivation of oyster mushroom by conducting 12 awareness camps in which 525 tribal farmers were provided with quality spawn of oyster mushroom and they adopted this technology. Prior to that, the local people were not even aware of the name of mushrooms, but, by the end of project, they introduced this delicacy in to their kitchens.



Local tribes learning and adopting the cultivation of oyster mushroom

New Fungicides Recommended to Combat Apple Diseases

Dr Shalini Verma, Dr HR Gautam, Dr Kishore Khosla, Dr Usha Sharma and Dr DP Bhandari

Chemical control has been the most effective method adopted by orchardists to protect their crops from fungal pathogens in apple and other crops. As the pathogens have started developing resistance against the conventionally used fungicides recommended to the orchardists, the combi products or pre-mixture offluxapyroxad 75 g/l + difenconazole 50 g/l SC @ 0.03 per cent is recommended at green tip stage of apple for the control of scab and powdery mildew, fluxapyroxad 250 g/l + pyraclostrobin 250 g/l 500 SC @ 0.01 per cent is recommended at fruit development (walnut size) stage of apple for the control of premature leaf fall and Alternaria leaf spot, boscalid 25.2 % + pyroclostrobin 12.8 % w/w WG @ 0.025 per cent is recommended at petal fall / pea stage of apple for the control of powdery mildew, and metrafenone 500 g/l SC @ 0.01 per cent is recommended as a new product at petal fall / pea stage of apple for the control of powdery mildew.

Fluxapyroxad is a succinate dehydrogenase inhibitor (SDHI) and is a new active ingredient with difenconazole and pyraclostrobin. It has both excellent preventative as well as curative activity through the inhibition of fungi at several stages of the fungal lifecycle including spore germination, germ tube growth, appresoria formation and mycelial growth.

Thus the premixtures of new SDHI product, fluxapyroxad offers high activity, very consistent performance, and built-in resistance management with two different modes of action for disease management.

Pyraclostrobin is an efficient fungicide in controlling different plant fungal diseases. It belongs to the strobilurins and is the leading systemic fungicide, found to exert their fungicidal action by blocking electron transport in the mitochondrial respiratory chain in fungi. The efficacy of strobilurins increases when mixed with other broad spectrum or contact fungicides in controlling diseases in field. They provide better control efficacy compared to single applications of traditional or strobilurin fungicides.

Difenoconazole is a broad-spectrum fungicide used for disease control in many crops. It has preventive as well as curative action and acts by inhibition of demethylation during ergosterol synthesis.

Boscalid is a new broad-spectrum fungicide belonging to the carboxamides (succinate dehydrogenase inhibitors) and is effective against different stages of fungal development, mainly against spore germination, germ tube elongation and also inhibits other stages such as appressoria formation or mycelial growth. After leaf uptake, boscalid is transported translaminarily and acropetally. It is very safe to the plants and covers a wide disease spectrum. It controls a broad range of fungal pathogens in arable and speciality crops.

Metrafenone is a new fungicide of benzophenone with protectant and curative properties intended for the control of powdery mildew fungi. Although the mode of action of metrafenone has not been determined, and is different from any other existing fungicide. At microscopic level, it inhibits the stages of fungal development related to the penetration into the plant tissues. It appears that the fungicide inhibits the growth of mycelium on the leaf surface, leaf penetration, formation of haustoria, and sporulation. It shows excellent preventative properties. It is able to penetrate across the leaf cuticle and, in small portion, to translocate toward the leaf margins.Some species may be resistant or develop resistance with continued application of this fungicide. Therefore, its rotation with products from alternative groups is essential for disease control.

All these second generation fungicides have proved as a new ray of hope for better management of apple diseases under field conditions.These compounds provide preventive, curative and long lasting efficacy against apple diseases.

NEWS DESK

Organization of Collaborative International Symposium

The Himalayan Phytopathological Society organized satellite Symposium on **"Crop Protection in Horticulture in collaboration with**International Association for the Plant Protection Sciences (IAPPS), the Crop Protection Societies in India, ICRISAT and XIX International Plant Protection Congress (IPPC 2019) on "**Crop Protection to Outsmart Climate Change for Food Security & Environmental Conservation**" at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) on 10-14 November, 2019, Hyderabad, Telangana, India. The satellite symposium was conducted within the broad themes of ICPP2019 viz. Climate change: Theemerging challenge; Host plant resistance: Biochemical and molecular mechanisms; Detection and diagnosis : DNA barcoding; and IPM Technologies. The symposium deliberations mainly focussed on key issues related to management of biotic and abiotic stresses in important horticultural crops through lead and invited oral presentations on climate smart and environment friendly technologies by the eminent plant pathologists of the India. The proceedings of the symposium wereconducted and Co-Chaired by Dr HR Gautam, Professor and Head, Department of Plant Pathology and Dr Satish K Sharma, Joint Director Research (H), Directorate of Research, UHF, Nauni. During the session 5 lead and 7 invited presentations were deliberated by more than 700 national and international delegates representing about 54 countries of the world. The detailed are as follows:

- Status of Marssonina blotch of apple in India and advancements in its management by Dr JN Sharma
- Economically important diseases in pomegranate: Recent status and management by Dr Jyotsana Sharma
- The role of entomopathogens in integrated control of white grubs in India by Dr R S Chandel.
- Diagnosis and management of diseases in coconut and arecanut: status and strategies by Dr Vinayaka Hegde
- SPNF a potential tool for plant health management by Dr Rajeshwar S Chandel

- Integration of soil solarization with other eco-friendly approaches for the management of soilborne diseases in horticultural crops by DrH R Gautam
- Advances in forecasting of late blight of potato by Dr Sanjeev Sharma
- Advances in the management of white root rot of apple by Dr Satish K Sharma
- Virus and Phytoplasma diseases of temperate fruit crops and biotechnological approaches for their management by Dr Anil Handa
- Plant pathogen interaction and weather components of disease progress for modelling apple scab epidemics in integrated systems by DrK P Singh
- Global improvements in cultivation of different edible fungi, commercialization and marketing scenario by Dr VP Sharma
- Hot water seed treatment: A successful approach to combat seed borne diseases in vegetable crops by Dr Narender K Bharat

FARMING HERO

Mr. Yussouf Khan S/o Sh. Mohammad Shafi, after completing his M.Sc. (Mycology & Plant Pathology) degree from Dr Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan (HP) did not run after the job but decided to do something new. During the year 2000, he established Khan Mushroom Farm & Training Centre at VPO Nangal Salangri, Tehsil & District Una (H.P). With his hard work, he is now a leading mushroom grower and also imparting consultancy in India and abroad. His centre is giving employment to atleast 15 youth of the area. He has been conferred with many awards for his outstanding work for promotion of mushroom cultivation in India and abroad. He is alos promoting cultivation of vegetables through hydroponics. He is recipient of many awards like award from University of Agriculture Palampur, Awards from Dr YSP, UHF, Nauni-Solan, National award by DMR- Chambaghat, State level award by Himotkarsh, Himachal Excellence Award, State level award by Divya Himachal, International Honour at Bahrain, Mushroom expert in Ministry of Bahrain 2010, First mushroom project in Bahrain in 2017.

Khan Mushroom Farm & Training Centre is doing a great job in promoting & popularizing mushroom cultivation not only locally but all over India. The centre attracts visitors from all over India as well as overseas. Centre is also an attraction for the training & exposure visits to the farmers conducted by

Department of Agriculture, Horticulture as well as for the Agricultural Universities students. The Centre also organizes commercial training courses on the mushroom cultivation to the interested individuals or groups and help them in establishing Mushroom projects. For more detail visit websites:www.khanmushroom.com

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