



Technology Notes

Himalayan Phytopathological Society



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From the Vice Chancellor's Desk

History is full of incidents wherein plant pathogens have had a serious impact on food security. The conflict of pathogens with plants and human beings continues, and there are a number of examples where pathogens have seriously affected the livelihood of the people. Globally, annual crop losses due to plant pathogens have been estimated to be between 20 to 40% of the total production. In terms of economic value, plant diseases alone cost the global economy around US\$220 billion annually, while the invasive pests cause an estimated loss of US\$70 billion. Over the last 40 years, effective management of insect pests and diseases has played a key role in increasing the food production, but pathogens still continue to claim 10–16 per cent of the global harvest. Late blight is probably the single most important disease of potatoes and tomatoes worldwide. A successful disease management strategy is one of the most important steps for sustainable crop production.



Electronic mode of communication has brought a 'communication revolution' in the farming sector, as the desired information is available on finger tips with gadgets like smart phones and tablets. Plantix is one of the best examples, which is a mobile crop advisory App for the farmers, extension workers and gardeners. It can diagnose plant diseases, pest damage and nutrient deficiencies affecting crops, and provides information on appropriate control measures. Plantix database had over 1.5 million images in 2017 with 80 per cent of its 300,000 to 400,000 users in India. Agropedia, spearheaded by IIT-Kanpur, is trying to create a forum where experts from across India can easily communicate with each other. Social media is able to cross the hurdle of illiteracy that has left the small and marginal farmers to the mercy of traders and middlemen. Services such as Digital Green, Spoken Web, Conspeakous VoiceGen and VoiKiosk are using audio and video uploads to convey crop and market information. A mobile-based service, called Gappa Goshti, allows Maharashtra farmers to send audio and video messages without using the keypad. Electronic mode of technology transfer has become an effective tool in the era of smart phones and social media.

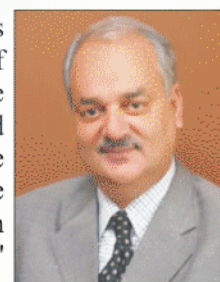
I am happy to learn that '**Himalayan Phytopathological Society**' in association with the Department of Plant Pathology of YSP University of

Horticulture & Forestry is starting an e-Magazine, '**Technology Notes**' to disseminate the information on recent advances in crop protection technologies to the extension workers and the farmers. The social media revolution is operating at several levels, and it empowers the farmers with recent knowledge. Farmers continuously need information about new seeds, pest diagnosis, rainfall, machinery, plant protection and prices. This helps them to choose the right crop, utilise resources efficiently, and maximise yield and income. This communication forum will certainly strengthen the bondage of the University scientists with the farmers with higher rates of technology adoption. Crop protection is an important component of crop production and this initiative will help in better percolation of the technologies. Efforts should be made to connect this magazine to the smart phones and e-mails to make it more interactive. I take this opportunity to congratulate the '**Himalayan Phytopathological Society**' and Professor and Head of Department of Plant Pathology and his faculty for this noble initiative. I am sure that it will play a major role in doubling the farmers income in the Himalayan region.

HC Sharma

Message

Dear Farmers, on 10th October, His Excellency, the Governor of Himachal Pradesh and also the Chancellor of Universities chaired YSPUHF Senate meeting. During the proceedings and earlier as well, he deliberated very critically and clearly on 'Zero Budget Natural Farming' interventions in Indian agriculture crop production system to minimize the use of chemicals. I admire and appreciate His Excellency's clarity on the concept, analysis, examples and how it would come to reality, it's very difficult but pleasant mission. I hope it would percolate and penetrate to the minds of the masses, who love Nature and natural concepts. HE emphasizes on 'Humus deposits' (the organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms) in the soil, which not only improves beneficial micro-organisms in the soil, also nutrients status around roots that provides resistance against to biotic and abiotic stresses. Means, if soil environment is healthy the sequential and consequential outcomes would also be better



Guest editors of the issue: Narender K Bharat and Bhupesh Gupta

for more and better crop quality. Working on 'Humus Deposits' is Natural Science; in reality plants survive under this phenomena. To take this concept to 'Real applied science' whatsoever contradiction so far, I would like to add few experiments in Zero Budget Natural Farming (ZBNF) with Zero Tillage (ZT) i.e. low loss of 'Humus Deposits' during field operations repeatedly. Mixing of ZBNF and ZT would come to General practice commonly called "Conservation Agriculture" i.e. minimum disturbance with maximum benefits. Conservation Agriculture (CA) is defined as a sustainable agriculture production system comprising a set of farming practices adapted to the requirements of crops and local conditions of each region, whose farming and soil management techniques protect the soil from erosion and degradation, improve its quality and biodiversity, and contribute to the preservation of the natural resources, water and air, while optimizing yields).

Under the directions in 2015, YSPUHF was the first in HP to start ZBNF. It being experimented on vegetables and floriculture crops and results were very good in 2015-18, which made the movement to ZBNF. However, in last three years, specifically in Apple the results were not very encouraging for many obvious reasons i.e. perennial behaviour and hard woody biomass of the tree, may take 10 years to get ZBNF benefits. Now, the concept of 'Humus Deposits' in the tree basins can improve and maintain permanently by adding ZT too. The tree basin operation can be stopped (will reduce cost & soil erosion as well) and the purpose so far is to regulate the Oxygen to the roots would come over by Millions of micro-organisms in the rhizosphere by ways of ZBNF interventions, which in 'Chain-like system' would provide oxygen to the roots regularly even now very efficiently. Oxygen supply to the roots as like to human beings and all living entities is a matter of acutely essential. No one can survive without it but soil biotic system can and can keep the roots to survive and revive throughout the biotic and abiotic conditions. More moisture absorption and conservation as needed by plants for growth and better quality would also be met with more microbial population as well as more numbers of Earthworms in such habitats.

JAI HIND

VS Thakur
Director Extension Education

Message

Plant diseases are one of the important factors which have a direct impact on global agricultural productivity. Combined infestation of pests and diseases in plants could result up to 82 per cent losses in attainable yield in case of cotton and over 50 per cent losses for other major crops. Further, plant diseases are estimated to cause yield reduction of



almost 20 per cent in the principal food and cash crops worldwide. In the last 40 years, effective management of pests and diseases has played a key role in doubling food production, but pathogens still claim 10–16 per cent of the global harvest. Plant diseases have also been a major threat to the crops in Himachal Pradesh as more than 70 per cent people directly depend on agriculture for their livelihood. Prevalence of diseases is part of the crop production system but different horticultural crops had been under serious threat to different diseases with potential to shatter the economy of the farmers. Diseases like apple scab and premature leaf fall, ginger rot, tomato buck-eye rot, Phytophthora blight of capsicum, powdery mildew of mango, crown gall of stone fruits, phytoplasma of peach, bacterial blight of pomegranate, ginger rot etc. had already dented the economy of the farmers despite a strong technology shield from the scientists of the University.

Further acceleration of the pace of technology generation and dissemination can better equip the farmers for effective disease management. I am happy to learn that 'Himalayan Phytopathological Society' in association with Department of Plant Pathology is starting an e-Magazine entitled, 'Technology Notes' to provide on-line access to the technology. In the era of smart phones, such an effort will make a great impact on the adoption of the plant protection technologies by the farmers. It has a broadened the outreach among the farmers with the new disease management technologies. I exhort the scientists manning the society to make this magazine interactive with regular inputs from the farmers. I appreciate the efforts of the Society and the scientists of the Department of Plant Pathology for this noble initiative in this era of communication.

JN Sharma
Director of Research

Message

Plant pathogens causes significant losses and pose a potential threat to crop biosecurity and agricultural sustainability. Apart from major diseases, minor diseases keep gaining importance due to changing and trade liberalization affecting normal crop productivity and biosecurity. Plant disease management practices rely on anticipating occurrence of diseases and attacking weak links in the infection chain. Therefore, diagnosis of a disease is of utmost importance in disease management program. A thorough understanding of the disease cycle, including environmental factors favourable for disease development and cultural requirements of the host plant, is essential for effective management of any disease.



The ravages of these plant diseases can be kept under check by employing various disease management

practices like cultural, host resistance, biological control and fungicide application. Plant disease management in the 21st century faces considerable challenges like resistance development in the pathogens, increasing public concern to the environmental issues of widespread fungicide use and breakdown in the effectiveness of host genetic resistance, besides impact of climate change. The aim of plant pathologists is to develop thorough understanding of plant-pathogen interaction, which is evolving continuously. Therefore, the need for understanding will not diminish.

The hazardous effect of chemicals on the environment and human health strongly necessitates the search for new, harmless means of disease control through phenomenon of induced resistance. Resistance in plants can be induced locally and systemically through various biotic or abiotic stresses. The genomics revolution has rapidly increased our understanding of the molecular mechanisms underpinning pathogenesis and resistance, contributed novel markers for rapid pathogen detection and diagnosis. The availability of whole genome resources coupled with next-generation sequencing (NGS) technologies has helped fueling genomics-based approaches to improve disease resistance in crops, which can now be applied routinely and cost effectively to rapidly generate plant and/or pathogen genome or transcriptome marker sequences associated with virulence phenotypes in the pathogen or resistance phenotypes in the plants.

I am happy to learn that the Himalayan Phytopathological Society is bringing out e-magazine which will serve knowledge to scientists, extension workers, students and farmers regarding new emerging disease problems, success stories carried out by the scientists and extension functionaries. The magazine will not only help in generating awareness about new emerging problems among farmers but also help in replicating the success stories in other areas as well.

I wish organizers a great success in this endeavour.

SK Gupta
Student Welfare Officer

e-Magazine - Initiative for Farmer Connect to Technologies

Department of Plant Pathology for the last 56 years with strong credentials of our faculty has made a niche in the farming community of the State. Scientific acumen and technology precision of the faculty helped the farming community of the State to brazen the onslaught of serious diseases in fruits, vegetables and ornamental crops which otherwise would have shattered the agriculture economy of the State. Over the years, scientists of the department were able to successfully control important diseases like apple scab, premature leaf fall, white root of apple, ginger rot, buck-eye rot



of tomato, apple cankers, phytoplasma of peach, powdery mildew and anthracnose of mango, bacterial canker of pomegranate, diseases of ornamental crops etc. The Department is also pioneer in developing the mushroom production technology for the first time in the country in the seventies which is now a major entrepreneur of the youth. We are continuous working on developing high yielding strains of button mushroom along with improvements in the growing substrates. In addition, production technology has also been standardized for Shiitake mushroom and some medicinal mushrooms. Emphasis is also given on eco-friendly methods of disease management. Department is keeping a tab on emerging problems of viral diseases of fruit, vegetable and ornamental crops. Work on technology for diagnosis of viruses, phytoplasma is also undertaken besides developing virus free planting material in different crops. Department has a working scientific manpower of more than 50 people including post-graduate students and research fellows which help us to generate lot of farm ready information. Our laboratories have international and national recognitions which are reflected in the present research funding of more than 1.25 crore. Technologies developed by the Department have been recognized at the national level and selected for prestigious programme of 'India Innovates' telecast by the National broadcaster-Doordarshan at the national level.

Department has worked equally hard to disseminate the disease management technologies through mix of communication means which were mostly had direct interaction with the farmers. Further, radio and television helped a lot to broaden the outreach of the Department. However, information and communications has opened up vast opportunities for technology dissemination and these technologies are playing an increasingly important role in keeping farmers and rural entrepreneurs informed about agricultural innovations, weather conditions, input availability, financial services and market prices, and connecting them with buyers. Mobile phones have great potential for promoting inclusiveness. Keeping in view the potentialities of electronic communication, scientists of the Department thought it prudent to start an e-Magazine under the banner of '**Himalayan Phytopathological Society**' with the name- Technology Notes so that the pace of technology dissemination is accelerated. We believe that faster dissemination of technologies will help us in higher adoption of the technologies which in turn will help in reducing the crop losses in different crops. We want to make this e-Magazine interactive with the feedback of the farmers and Field Extension Officers.

HR Gautam
Professor and Head

*"When you are contemplating an action, recall to your mind
The face of the poorest, the most oppressed man you know
and ask yourself, is the action I am going to take going to
help this man?"*

... Mahatma Gandhi

EMERGING PROBLEMS

Occurrence of Apple Scab Disease in Warmer Areas of Himachal Pradesh

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There has been an increasing trend of growing low chilling varieties of apple such as Anna, Mollie's Delicious, Michael, Dorsett Golden and indigenously developed Hariman-99 in lower belts of Himachal Pradesh experiencing warm and humid climatic conditions. These varieties are becoming increasingly popular amongst farmers of Mandi, Kangra, Hamirpur, Una and Bilaspur districts of the State. There are reports of low chilling apple cultivation in Punjab and some Southern States. The areas traditionally being a non apple growing areas, the amateur growers are not aware of the diseases infecting apple crop and their control measures. Practically, no control measures are adopted by the growers. So, there is a high incidence of diseases like leaf spots and powdery mildews. This year (2018) a low to high incidence of apple scab disease caused by *Venturia inaequalis* (Cke.) Wint. was frequently observed for the first time in Balh area (900-950m a.m.s.l.) of Mandi district. The disease was first observed on leaves as olive coloured and irregular spots on Anna variety in traces on 3rd June in village Dhaban. The initial symptoms on the undersurface of the leaves were somewhat olive coloured light and irregular in shape lesions. Later, the lesions became olive green with velvety grayish dark surface and circular in outline. Late, such lesions became metallic black in colour and slightly raised. On fruits, circular almost distinct, olive green lesions appeared turning darker and fruit cuticle cracking was frequently observed resulting into misshapening of the infected fruits. Secondary spread of the disease appeared as numerous small olive green lesions on upper surface of the leaves, coalescing together giving a 'sheet scab' appearance, leaves turning yellow and fall prematurely. The varieties Mollie's Delicious and Dorsett Golden were also found infected during 2nd week of June with an incidence ranging between 0.5 to 14.0 percent at Dhaban, Bhour, Lunapani, Tawan and Rajgarh areas of Balh Development block. During 4th week of June, a high incidence on leaves (5.0-32.0%) and on fruits (1.5 to 16.0 %) was observed on Anna and Mollie's Delicious varieties. Other varieties such as Dorsett Golden, Hariman-99 and Royal Gala were also found infected in July. However, there was no incidence of

apple scab on fruits of these varieties. The high rains and humid conditions prevailing during June-July might have provided congenial environmental conditions for the development of apple scab disease in these areas. Since, the vegetative growth of apple tree in warmer areas is more and has a direct relationship with the incidence of apple scab, therefore proper planting distance, pruning and training of the trees, proper nutrition and adopting suitable control measures for combating the incidence of diseases and insect-pests are some of the factors requiring utmost attention of the growers to harvest good crop for longer period.

White Rot Disease : A Threat to Garlic Cultivation in Mid Himalayan Region

Narender K Bharat

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Garlic (*Allium sativum* L.) is an important crop of farmers of Sirmour, Kullu, Mandi, Solan, Shimla districts of Himachal Pradesh. In Sirmour district it is the major cash crop in upper hilly areas and the livelihood of the farmers is solely dependent on this crop. Due to extensive cultivation and lack of crop rotation, a disease problem is threatening the entire garlic cultivation in the state especially in Sirmour district. The disease was noticed in some garlic growing pockets at Nohradhar and Haripurdhar four to five years back. But this disease has now gripped almost all the garlic growing areas. The farmers are not aware of the symptoms, spread and management of this deadly disease and therefore are facing severe yield and monetary losses. The disease is first initiated through infected seed bulbs and later establishes itself as a soil borne disease. Thereafter, due to monoculture it spreads at a very fast rate. The farmers should therefore know about the symptoms and management of the disease. Affected plants show yellowing and wilting of leaves with stunted growth and can be easily uprooted from the soil. While observing such plants, a white and fluffy mycelial growth can be seen on bulb and underground stem. On the white mycelia mat, small black coloured sclerotia about the size of a poppy seed are seen.



The disease is caused by a fungus *Sclerotium cepivorum* which is a soil borne pathogen and also spread through infected seed bulbs. Continuous cultivation of

garlic in a single field, moderate temperature and high soil moisture favour the disease.

For the management of this disease, the farmers should collect and destroy infected crop debris, follow crop rotation with other non-host crops, and should use healthy seed bulbs collected from disease free field. Application of organic cakes and formulations of antagonists like *Trichoderma* spp. to the soil before planting also reduce the disease incidence.

Apple Viroid Diseases : The Emerging Problems for Apple Plantations

Usha Sharma

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Apple suffers from diseases of fungal, bacterial and graft transmissible pathogens (GTPs) etiology which cause huge economic losses to the farmers. Apple is infected with GTP viroids like apple scar skin viroid (ASSVd), apple dimple fruit viroid (ADFVd) and Apple fruit crinkle viroid (AFCVd). Among these, Apple scar skin viroid (ASSVd), the type member of genus *Apiscaviroid* family *Pospiviroidae*, was the first viroid reported to infect pome fruits tree (*Malus*, *Pyrus* and *Cydonia* spp.) by Hashiaroto and Kogamezawa in 1982. Apple scar skin viroid is an emerging disease found with increasing frequency in the apple growing areas of Himachal Pradesh. In India, the disease was reported by various workers (Thakur *et al.*, 1995 and Behl *et al.*, 1998). Handa and co-workers in 1998, surveyed apple orchards in Shimla district and recorded the presence of dappling symptoms on fruits only with 2.0 % incidence in a few orchards. However, the incidence of viroid infection upto 90% was recorded in the orchards located in Lakadhar and Chiyog village of Chirgaon and Theog blocks, respectively of district Shimla, Himachal Pradesh.



Apple growing region of north western Himalayas of Himachal Pradesh was surveyed in the months of July to October during 2015-16 and 2016-17, 2017-18 to determine the occurrence, distribution and status of viroid disease in apple orchards. Disease incidence based on symptoms was recorded in 50 randomly selected apple orchards. The incidence of viroid infection ranged 2.0-95.0% in six out of 50 orchards surveyed with highest 90% in the orchards located in Lakadhar and Chiyog of Chirgaon and Theog blocks, respectively of district Shimla, HP. All other orchards were found without typical symptoms of viroid infection. Interestingly, it does not produce any symptom on the vegetative plant parts of apple tree. The viroid mainly causes symptoms on apple fruits, rendering them unmarketable. Almost all fruit on an infected tree of a susceptible cultivar show symptoms. The symptoms appeared as round, yellowish green spot 3-4mm in diameter after the appearance of red colour on fruit skin. In most of the cases, these round spots coalesce and large discoloured area developed predominantly at calyx end. On some fruits, russetting in definite streaks appeared on stalk end. In severe cases, cracks on fruits were observed. No apparent symptoms were recorded on the leaves of the infected trees. It was also recorded that ASSVd infection not only deteriorate the quality of apple fruits but cause huge losses in term of yield, as 17.80 quintal less fruit production with loss in net return upto Rs. 3,91,102/- per hectare.

As viroid persist within infected tissue and then exert their effect throughout the life of the orchard. Hence, certification program is essential to manage this viroid because of its symptomless behaviour in vegetative parts of most of the commercial cultivars. Farmers procuring planting material from unregistered private nurseries which does not have certified mother plants are at risk getting infected planting materials. After 8-10 years infected plants will show symptoms on fruits which can cause tremendous economic losses to the farmer especially in developing countries like India.

Bacterial leaf spot (*Xanthomonas cucurbitae*): an emerging threat for cucurbit cultivation in sub tropical zone of Himachal Pradesh

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and Sujata Kumari**

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The cultivation of the cucurbits is hampered by the attack of many pathogens and insects, out of which *Xanthomonas cucurbitae* (Bryan) Dowson (Syn.: *Xanthomonas campestris* pv. *cucurbitae*) causing bacterial spot has emerged as an important pathogen in the sub tropical zone of Himachal Pradesh leading to huge crop losses especially to bottle gourd, pumpkin, sponge gourd, bitter gourd, cucumber and squash. Earlier the disease was



A severely infected Bottle gourd field and a plant

more serious on bottle gourd causing around 10 to 70% losses. But the pathogen has now been recorded on other cucurbits too. In the routine surveys to districts Hamirpur, Bilaspur, Una, Kangra and some parts of Mandi during 2017-18 crop season, pumpkin, sponge gourd, cucumber and bitter gourd were also found severely infected with the disease, in addition to bottle gourd. An incidence of disease ranging between 20 to 100% was recorded in different crops surveyed at various locations of the zone. Bottle gourd and sponge gourd were affected badly as the bacterium attacks the fruits at an early stage of crop growth leading to huge crop losses.



Symptoms on young bottle gourd fruits

Septoria Leaf Spot on Marigold (*Tagetes erecta* L.) : A New Disease in Himachal Pradesh

Arti Shukla

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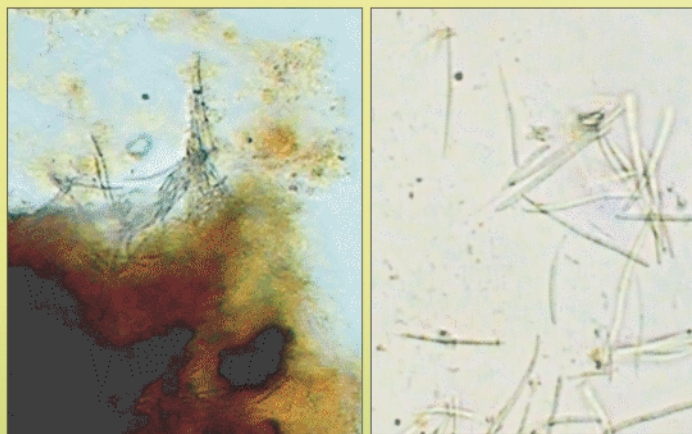
Marigold constitutes as one of the five most commonly cultivated and used flower in urban and rural India for decorations and religious functions. It is a native of Mexico and South America and was introduced in India from Portugal in 16th century. Out of the 33 species two viz., African marigold (*Tagetes erecta*) and French marigold (*T. patula*) are commonly cultivated in India with highest acreage in Madhya Pradesh. Himachal Pradesh ranks 9th in area and production of marigold with an area of 179.25 ha and annual production of 15,774 MT. The crop is also gaining importance in mid hills of Himachal Pradesh including district Solan where it is grown over an area of 9.76 ha with annual production of 102.53 MT.

The plants are relatively easy to grow, but are susceptible to many fungal and bacterial diseases. During the year 2016, African marigold plants grown at KVK, Kandaghat were found infected with a leaf spotting disease during the months of July-August. Symptoms commonly appear on leaves, but sometimes also occur on petioles, stems, and the calyx. On older leaves initially small, water-soaked circular spots appear. The centers of these spots gradually turn gray to tan and have dark brown margins. Later the spots enlarge, coalesce and have dark brown, tiny dot like structures called pycnidia (fruiting bodies of the

fungus) readily visible on their tan coloured centers. Affected leaves turn yellow to brown, shrivel and drop off. The severity of the disease ranged from 30-70 per cent in marigold growing areas. The pathogen was isolated in to a pure culture. The colonies were initially white later on develop slight brown tinge with irregular margins. The mycelium was hyaline and branched. The conidia were hyaline, narrowly elongate to filiform, measuring 25.2-48.7 μ in length and 1.04 to 2.98 μ in breadth with an average of 39.2 x 2.0 μ . On the basis of symptoms and spores morphology, the fungus was identified as *Septoria* spp. This constitutes the first report of leaf spot caused by *Septoria* sp. on marigold from Himachal Pradesh.



Symptoms of septoria leaf spot on marigold plant and leaves



The pathogen (*Septoria* sp.) Pycnidium and Conidia

Disease scenario in dry temperate zone under changing climatic scenario and future prospects for management

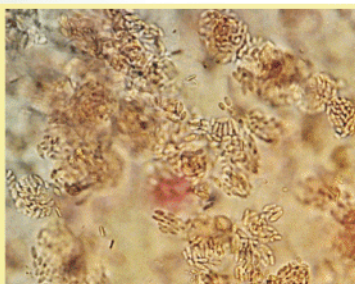
Durga Prashad

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On walnut growing in dry temperate zone of Himachal Pradesh, powdery mildew (*Phyllactinia juglandis*) appeared in epidemic form in all blocks of district Kinnaur. Cleistothecia initiated in the month of Nov-December in both thin and thick shelled walnut. Because of vigorous tree growth spray application at the top could not be possible. Therefore alternative approach of disease management through host resistance is the only alternative to keep disease under check. Incidence of *Cryptosporiopsis corticola* was highest in Nichar (28.9 %) followed by Kilba



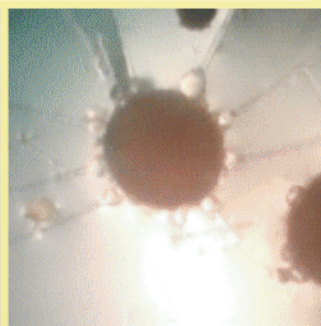
Stem bleeding



Conidia of *Cryptosporiopsis* sp.



Powdery mildew on walnut (*Phyllactinia juglandis*) with Cleistothecia



Disease complex of canker with shot hole borer on apple in Kinnaur



Shot hole spots on leaves and fruit of Apricot



Shot hole on Almond fruits

(26.98%). Some incidence of *Cryptosporiopsis* sp. was also observed on apple in Kinnaur with varying degree. Disease is characterized by oozing of cell sap from cut ends or wounded portion. Scarification up to cambium layer and application of white paint amended with carbendazim (10g/ltr) protected infected plants against smoky blight canker. On pea, incidence of *Ascochyta* blight aggravated due to occurrence of erratic rainfall in Kunnu and Charang

valley with a severity of >85% and it could be managed successfully with seed treatment and foliar sprays of carbendazim and copper oxychloride. Shot hole in almond and apricot has emerged a routine disease in dry temperate region of Kinnaur with disease severity of 15.82 to 57% and managed successfully with sprays of hexaconazole (0.05%) followed by carbendazim (0.05%) and copper oxychloride (0.3%), respectively. With the introduction of spur cultivars in Kinnaur, disease complex of shot hole borer with canker fungi have been recorded which needs to be identified and suitable management tactics to develop decision support system for effective management. Rust in Pistachionut has been routine appearance with low to moderate severity and can be checked with sprays of hexaconazole (0.05%) at disease appearance and another two sprays of flusilazole (0.05%) and hexaconazole (0.05%), respectively.

Bacterial Wilt – An Emerging Disease in Ginger

Meenu Gupta

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Ginger is an important cash crop of farmers of Sirmour district of Himachal Pradesh. During the last few decades, area under ginger cultivation has been decreasing drastically which may be due to many factors including bacterial wilt. The symptoms appear as water soaked linear streaks on the collar region of the pseudostems followed by yellow to bronze colouration of the margins of the lower most leaves which gradually progresses upwards. Later, the leaves become flaccid exhibiting wilt symptoms and intense foliar yellowing. The affected pseudostems at the base would be slimy to touch and come off with a gentle pull. A small piece of the affected tissue kept in water gives off milky white bacterial ooze. The affected plants droop and dry. The disease is caused by a bacterium *Ralstonia solanacearum*. The disease is typically soil and seed borne. It is generally noticed during July-September and would be maximum during August-September coinciding with monsoon.



Linear streaks on pseudostem



Infected rhizomes



Ooze in water

Select healthy seed rhizomes, eradicate weeds and adopt proper crop rotation. Treat rhizome with hot water (47°C for 30 min) and streptomycin (200 ppm) for 30 min before planting followed by three sprays, first at 30th day after planting and others at 15 days interval. Use bacterial antagonists, *Bacillus subtilis* and *Pseudomonas fluorescens*.

TECHNOLOGIES DEVELOPED

Technology Generated for use of Biological Indicators for Simultaneous Detection of Four Major Viruses of Apple

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Two new viruses namely apple stem grooving virus (ASGV) and apple stem pitting virus (ASPV) have been reported for the first time in apple plantations in Himachal Pradesh. DAS-ELISA protocols have also been standardized for the detection of these two viruses.

Biological detection with the use of woody indicators viz. Virginia crab, *M. platycarpa*, Spy 227, Jay Darling and Russian Clone has been successfully conducted for the detection of mixed infection of ASGV, ACLSV (apple chlorotic virus), ApMV (apple mosaic virus) and ASPV by double grafting, grafting cum budding and double budding methods. This is the first report of use of these biological indicators for the detection of these apple viruses in India.



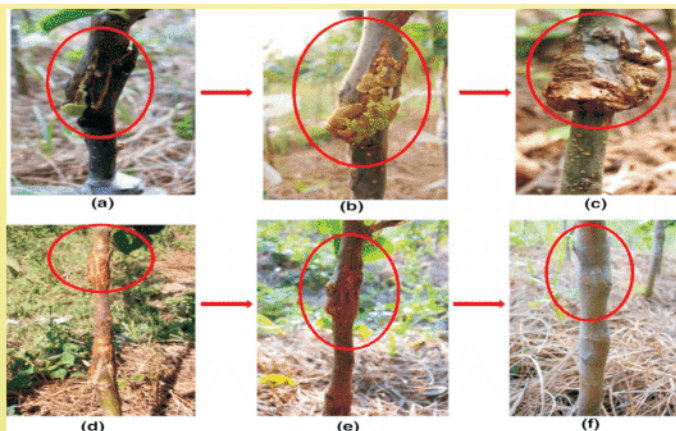
Double grafting



Small red lesions and necrotic spots on Jay Darling indicator

Virginia Crab and Spy 227 indicators exhibited swelling at the graft union along with brown line necrosis typical of ASGV infection. This unique symptom might be due to the interaction of different viruses present in the test bud wood in the form of mixed infection and is the key to early detection of virus infections in apple.

Jay Darling indicator produced easily recognizable symptoms of red spots on leaves in addition to distorted leaves. Hence all these biological indicators were found to be highly suitable for virus indexing in Indian conditions.



Double grafting of test isolate and indicator bud wood (a, b, c) and virus free healthy isolate and indicator bud wood (d, e, f). a Showing callus initiation after 30 days of double grafting b After 50 days of double grafting c after 90 days of double grafting d Depicting normal graft union between healthy test plant and indicator bud wood after 30 days e after 50 days and f after 90 days of double grafting

Tricho Vir – A Biocontrol Formulation for the Management of Soil Borne Diseases

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Tricho Vir - A talc based formulation of fungal antagonist *Trichoderma viride*, which has been developed through continuous efforts by the scientists of Department of Plant Pathology, in the service of the farmers. *Trichoderma* fungus controls soil borne diseases through multiple actions including competition for site, mycoparasitism, antibiosis, plant growth promotion. This not only controls the pathogen but improves plant health through improving local and systemic resistance development.



Seed treatment/ Bio-priming: Apply 20 g dry powder per 1 kg seed and sprinkle water on it so that a thin layer covers the seeds. This provides shield to germinating seeds against various soil borne diseases.

Soil application: To manage soil borne diseases with Tricho Vir : Mix thoroughly 10 g Tricho Vir per 1 kg of FYM, cover

it with moist gunny bag for 3-4 days , so that *Trichoderma viride* colonize the FYM thoroughly. Now this mass multiplied biocontrol agent can be applied @ 40g/m² for nursery disease management, whereas, for field application it should be applied @ 20 g/m².

The users can get the formulation from the Department of Plant Pathology on demand.

SUCCESS STORIES

Collar Rot Management in Apple

Usha Sharma¹ and Bhupesh Gupta²

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Dr YSP University of Horticulture & Forestry
Nauni, Solan (HP).

Collar rot caused by *Phytophthora cactorum* is a very serious problem in almost all the apple growing areas. The disease causes severe losses to apple growers resulting in decreased productivity per unit area with poor quality of fruits. Affected apple trees show sparse foliage, slow growth, bronzing and yellowing of leaves with coffee brown colour of bark at collar region. The root rot phase of the disease is misunderstood with white root by the farmer, which leads to the treatment with carbendazim, which further aggravates the problem. The incidence of the disease is sometimes upto 50 percent in many of the orchards especially, where the orchards are planted in heavy soils with low pH. Looking at the gravity of the problem, a campaign was started to make the farmers aware of this problem and subsequently laid out trials and demonstrations for the integrated management of this disease as per the recommendations by Dr YSP UHF, Nauni, Solan and its Regional Horticultural Research Station Mashobra with slight modifications as per the regional requirement to overcome this serious problem. The farmers were educated about the proper site selection, soil testing, cause of disease, symptomatology and integrated disease management practices to be adopted for the management of the disease. The farmers were also advised to improve cultural practices i.e. improvement in water drainage system in the tree basin, opening of collar region of the affected plants and removal of affected portion with the application of Chaubatia paste on open wounds (preferably in months of November & December). The drenching of metalaxyl 8 + mancozeb 64 WP @ 0.4% was given as and when symptoms were noticed, and three drenching in rainy season at 15 days intervals i.e. two drenching of metalaxyl 8 + mancozeb 64 WP @ 0.4% and one Bordeaux mixture @ 1.0%. In addition to this, seedling/ resistant rootstocks (4-5 per plant) were also grafted in the month of March and April through approach grafting technique to the infected plants from the affected side to provide additional support and nutrition. Since, the production and quality of fruits in the affected orchards has heavily resulted in monetary losses to orchardists, therefore

farmers adopted this integrated disease management module, and enabled themselves to recover the yield losses within three to four years.



An OFT was conducted in the orchard of Sh Mohan Lal Sharma, Village Shari, Jubbal, Shimla (HP), who is a one of the progressive and innovative farmers, who adopted the technology. Apple plantation in his orchard was affected

with collar rot disease as a result 4-5 plants out of 500 lost in the year 2007. During 2008 and onward, he started curing the diseased plants. He saved more than 50 apple plants in his orchards by following this integrated approach of disease management.

Transfer of technology was done through Front Line Demonstrations in different villages for successful replication of the technology. Yogeshwar and Dilip Singh Banshtu of Dalgaon, Naina Sharma of Shari, Ramesh Divanta of Dhara, Nitin Sharma of Kuddu, Rajkamal of Saio, Pawan bajrangi of Jagothi Nala, Padam Kajolta & Surinder Sharma of Chalnair villages have adopted this technology and prolonged the life of collar rot affected trees and enabled themselves to recover the yield losses within three to four years.

Mera Gaon Mera Gaurav - Changing Lives of the Farmers

Manica Tomar

**Directorate of Extension Education
Dr YSP UHF, Nauni, Solan**

Mera Gaon Mera Gaurav (MGMG) is an innovative scheme of Government of India formulated under frontline extension programme by the Agriculture Extension Division, ICAR, New Delhi. The Deputy Director General, Agricultural Extension Division, ICAR is implementing authority of MG-MG in the country through the network of ATARIs located in different zones. The objectives of MG-MG are

- To promote the direct interface of scientists with the farmers to hasten the lab to land process.
- To ensure that farmers benefit from best farm practices by providing required information, knowledge and advisories on regular basis by adopting villages
- To create awareness among farmers about the organisations and their programmes and schemes as well as government policies related to the farming sector.
- To imbibe a sense of ownership among the agricultural scientists of the country.

The scheme was implemented in the university in December 2015. A total of 32 teams comprising of four to five scientists were formulated. Each team was assigned a village in the vicinity of 50 kms from the university. The regular visits of the teams to the respective villages have started to yield fruits. Due to MGMG awareness has been created amongst farmers regarding new schemes launched by Govt., ATMA, voluntary organizations, national issues like Climate change, Swachh Bharat mission, water conservation, soil fertility, zero budget natural farming etc. The continuous and arduous efforts of the scientists have persuaded the farmers to cultivate high value crops like Kiwi fruit, exotic vegetables like broccoli, Knol Khol, Brussels sprouts etc besides their traditional crops. Farmers have taken interest in zero budget natural farming and have

been continuously in touch with scientists on the same. The farmers stay in touch with scientists for taking advice regarding spraying of pesticides to avoid indiscriminate use of agrochemicals including spurious formulations. Farmers have been advised to use PGPR and *TrichoVir* as soil amendments against soil borne pathogens. This innovative scheme has improved the farmers-scientist interface for creating awareness amongst farmers.



Launch of MGMG in YSPUHF



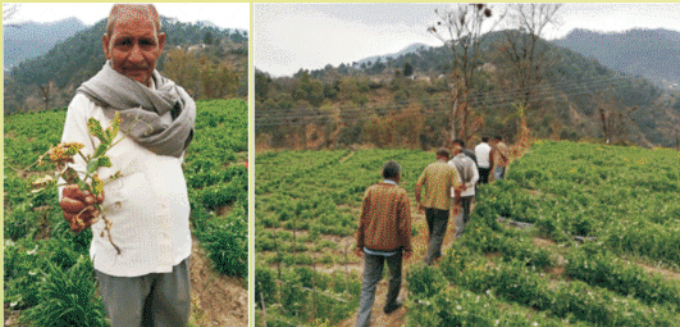
Owing to motivation by MGMG team of Dharot Panchayat, Mr. Parmanand Sharma has established a block of 70 plants of kiwifruit in village Shlumna. He was also guided to seek financial help under *Kiwi Protsahan* Scheme financed by Department of Horticulture Solan.



Scientists interacting with the farmer in the Garlic field



Polyhouse inspection by the scientists in Karganoo village



Scientists inspecting the infected pea crop

Occurrence of *Morchella* species in sub tropical zone of Himachal Pradesh

RS Jarial and Kumud Jarial

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Morchella Dill. ex Pers., commonly referred to as “Guchhi” in India is an economically important morel mushroom belonging to family Helvellaceae in phylum Ascomycota. It is a saprophytic fungus which grows in humus rich soils in undisturbed areas. Mainly its species are reported to occur in temperate forests of Himalayas. It mainly grows in higher altitudes, hilly landforms with cool microclimate. In Himachal Pradesh, it is commonly found in



Ascocarps of *Morchella* visible at different sites

higher hills of Shimla, Kinnaur, Simour, Mandi and Chamba districts. However, its occurrence has not been reported from sub tropical zone of the state. During the month of October, 2018, *Morchella* sp. has been found to occur in few places of district Hamirpur including Bohni, Heera Nagar, Salasi and Hamirpur. At all these places, the ascocarps appeared in the shady and damp areas. Its presence has never been claimed earlier at these places.



Detached Ascocarps of *Morchella* collected from Hamirpur

Thus it constitutes the first report of occurrence of *Morchella* species from sub tropical zone of Himachal Pradesh.

अनार के मुख्य रोग एवं उनका प्रबन्धन

सतीश कुमार शर्मा

अनुसंधान निदेशालय

डॉ यशवंत सिंह परमार औद्यानिकी एवं वानिकी विश्वविद्यालय
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पत्ता धब्बा व फलसड़न रोग: रोगजनक फफूंद व जीवाणु सबसे पहले पत्तियों पर धब्बे बनाते हैं बाद में फलों में संक्रमण करके धब्बे व सड़न पैदा करते हैं, जिनका विवरण इस प्रकार है।

1. फफूंद जनित

क) कोलेटोट्राइकम ग्लोयोस्पोराइडस

जनित रोग: इस रोग में पत्तियों पर छोटे आकार के बैंगनी काले रंग के धब्बे बनते हैं जो चारों ओर से हल्के पीलेपन से घिरे होते हैं। अधिक प्रकोप में रोगी पत्तियां समय से पूर्व गिर जाती हैं। फलों पर भी गोल काले रंग के बीच से धंसे हुए धब्बे बनते हैं व ऐसे फल नर्म होकर सड़ने लगते हैं। रोगी पत्तों व फल डण्डी से रोग संक्रमण टहनियां तक पहुंचने से वे प्रायः ऊपर से नीचे की ओर सूखने लगती हैं।



ख) फोमोपसिस ओक्व्यूबिकोला

जनित रोग: इसमें पत्तियों पर छोटे आकार के भूरे रंग के धब्बे पड़ते हैं जिनके बीच में काले रंग के छोटे-2 बिन्दु आकार



के बीज के घड़े (पिक्निडियम) बनते हैं। रोगी पत्तियां समय से पूर्व गिर जाती हैं व प्रभावित टहनियां सूखने लगती हैं। फलों पर गहरे रंग के अनियमित आकार के धब्बे पड़ते हैं जिनमें सड़न पैदा होती है।

प्रबंधन: रोगी फलों को एकत्र कर नष्ट करें। रोगी टहनियों को सर्दियों में काट कर कॉपर ऑक्सीक्लोराइड 300 ग्राम या बोर्डो मिक्सचर 1 कि० ग्रा० नीला थोथा + 1 कि० ग्रा० चूना अनुबुद्धा प्रति 100 लीटर पानी में डालकर छिड़काव करें। जून - जुलाई में रोग के लक्षण दिखाई देते ही कारबेन्डाजिम 50 ग्रा० + मैन्कोजैब 250 ग्रा० या कैप्टान 300 ग्राम या कॉपरऑक्सीक्लोराइड 300 ग्राम प्रति 100 लीटर पानी का छिड़काव 20 दिन के अन्तराल पर 2 - 3 बार करें।

2. जीवाणु जनित

जेन्थोमोनस एकजोनोपोडिस उपजाति प्यूनिकी द्वारा जनित रोग में पत्तियों पर छोटे - 2 अनियमित व जल सिंचित धब्बे पड़ते हैं व प्रकाश में सामने देखने से पारदर्शी दिखाई देते हैं। धब्बे बीच से भूरे व किनारों से काले भूरे रंग के होते हैं। ग्रसित पत्तियां पीली पड़कर गिर जाती हैं व प्रभावित पौधों की वृद्धि रुक जाने के कारण पौधे बौने रह जाते हैं। इस प्रकार का प्रकोप गणेश, मृदुला व सिंधूरी किस्मों में अधिक होता है। फलों पर भी गहरे भूरे रंग के व अनियमित आकार के धंसे हुए चिपचिपे धब्बे बनते हैं। कई बार प्रभावित फलों में दरारें पड़ जाती हैं व रोगी फल सड़ जाते हैं।



प्रबंधन: रोग अवशेषों जैसे फलों इत्यादि को एकत्र कर नष्ट करें। जून - जुलाई में रोग के लक्षण दिखाई देते ही स्ट्रेप्टोसाईक्लीन 10 ग्राम प्रति 100 लीटर पानी में डाल कर अकेले या कॉपरऑक्सीक्लोराइड 300 ग्राम में मिलाकर 15 - 20 दिन के अन्तराल 2 - 3 बार छिड़काव करें।

कैंकर व डाईबैक

यह रोग *स्यूथोस्पेरा फाइलोस्टिकटा* नामक फफूंद द्वारा उत्पन्न होता है। आरम्भ में छोटी टहनियों के ऊपर काले भूरे अण्डाकार धब्बे बनते हैं। रोगी भाग चौड़े, धंसे व उठे हुए किनारों वाले होते हैं। रोगग्रस्त टहनियों की छाल सूखकर फट जाती है व निचले भाग की लकड़ी पर गहरे भूरे व काले रंग का बदरंगापन दिखाई देता है। ऊपर की टहनियां सूख जाती हैं। अधिक संक्रमण होने पर पूरा पौधा भी मर जाता है।



प्रबंधन: इस रोग की रोकथाम के लिये पत्ते झड़ने के समय कॉपरऑक्सीक्लोराइड (300 ग्राम प्रति 100 लीटर) नामक फफूंदनाशक का छिड़काव करें। सर्दियों में रोगग्रस्त टहनियों को काट कर जला दें व सर्दियों में ही कैंकर भाग को हरे भाग तक छीलकर चौबटिया पेंट का लेप करें।

कालर रॉट:

यह रोग *फाईटोफथोरा* प्रजाति की फफूंद द्वारा जनित रोग है। आरम्भ में इस रोग से ग्रसित पौधों की पत्तियां पीली हो जाती हैं। टहनियां मुर्झा कर लटक जाती हैं व ऊपर से सूखना आरम्भ करती हैं। तने की छाल मिट्टी की सतह से सड़ जाती है, लकड़ी भूरी काली पड़ने लगती है व बाद में पूरा तना सूख जाता है।



प्रबंधन: बागीचों में जल निकासी का उचित प्रबंध करें। आरम्भिक लक्षण दिखाई देते ही रोग ग्रसित तने व मिट्टी को रिडोमिल एम - जैड 300 ग्राम या मैन्कोजैब 400 ग्राम या कॉपर ऑक्सीक्लोराइड प्रति 100 लीटर पानी के घोल से 2 - 3 बार 20 दिनों के अन्तराल पर तने के चारों ओर डालें।

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