

First Report of Gummosis Disease of Major Fruits in Gilgit-Baltistan (GB) Pakistan

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ABSTRACT

Gummosis is the most severe disease on the fruit trees of Gilgit-Baltistan (GB) region of Pakistan. In summer 2016, gummosis disease was observed on apricots, cherry, peach, plum and almonds trees in orchards of Nomal and Nagar Valleys in GB region of Pakistan. The diseased trees initially exhibited sunken lesions on the trunks, twigs and branches of fruit trees. Later these sunken lesions become darker in color and exudation of yellowish or whitish or transparent gum through these lesions become prominent. With the age of plants canker develops on the trunk and branches of fruit trees. Gummosis can result from infection by plant pathogen, due to climatic changes, injuries and pest infestations. The disease can be controlled by cultural, biological and chemical methods. To my knowledge, this is the first report of gummosis disease on apricots, cherry, peach, plum and almonds of GB.

Key-words: Gummosis, Plant disease, Gilgit-Baltistan (GB), Fruit trees, cankers

INTRODUCTION

Gilgit-Baltistan (GB) is one of the major fruits producing region of Pakistan. The fruits are primarily produced as cash crop and notably the apricot, cherry, almonds, plum and peach. Among these fruits apricots are widely planted in GB. Furthermore GB is major apricot producing region in Pakistan. According to one estimate the total fruit production is about 170680 tons fruits per annum^[1]. Regular grafting and planting seeds from the superior trees have increased the variations. However due to varying climatic and soil conditions the fruit trees are exposed to disorders. Heavy floods due to melting of glaciers in summer season change the soil conditions and interrupt the normal gaseous exchange between fruit trees and their environment. Moreover causes sedimentation and weaken trees. The roots, root collar, and lower stem of fruit trees are significantly affected by floods. The injuries in these parts make fruit trees

susceptible to pests and diseases. Moreover high winds in late autumn season causes severe injuries consequently fruit trees become vulnerable to severe diseases. Severe frost, snow and ice are also causing cracks in the main trunk, branches and twigs of fruits trees. These cracks become entry point for the diseases. These diseases are continuously reducing the productive capability of fruit trees and adversely affect the fruit quality. Moreover the introductions of high yielding varieties are continuously replacing the local varieties. Though these varieties are high yielding however in varying climatic conditions these varieties soon become exposed to diseases. The production of apricots, cherry, almonds, plum and peach has dropped largely as a result of diseases such as gummosis, cankers, crown galls, Grey mold and Shot hole disease^[2]. Among these diseases gummosis is one of the devastating diseases on these fruit trees. The causes of gummosis are still obscure. Gummosis is associated with the diseases, pests and also with other abiotic factors such as high winds and snow. Pruning and grafting with unsterilized tools can also cause gummosis. Some researchers consider gummosis as non-specific defensive response of trees against the diseases and other differential stresses^[3]. Anyhow the disease has seriously affected thousands of apricots,

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cherry, almond, peach and plum trees in Gilgit-Baltistan (GB). The disease is characterized by deposition of gums that has oozed through the barks of main trunk, twigs, and branches and even on the fruits. With the age canker develop along the main trunks, branches and twigs of fruit trees ^[4].

The association of gummosis disease with the fruit trees has a long history. Therefore gummosis can be considered as a perennial disease of fruit trees in GB. Local people usually consume the gum exudates as an edible food. The gums have Functional, antioxidant, antimicrobial, and medicinal properties ^[5]. In June, 2016 the fruit trees are surveyed and assembled first

information regarding gummosis disease. Gummosis on cultivated apricots of Nomal Valley is shown in Fig. 1, Cherry in Fig. 2 and Almonds in Fig. 3. Gummosis on apricots of Chalat Valley, District Nagar is shown in Fig. 4. Gum deposits were yellowish, transparent and irregular in shape. The diameter of the gum deposits was 4 to 5 cm around lenticels of trunk and branches. However the diameter of the gum deposits on the twigs was 1 to 2 cm. Gummosis is continuously spreading to other fruit growing regions of GB. Not a single variety of fruit tree is found to resistant against the gummosis. Therefore timely management of this disease is very important.



Fig. 1: Symptoms of gummosis affecting the main branches of apricot trees of Nomal Valley (Courtesy; Riaz Paras)



**Fig. 2: Symptoms of Gummosis affecting the main branches of Cherry trees of Nomal Valley (Courtesy: Riaz Paras)
(Source: Village Nomal, Gilgit Baltistan, Pakistan)**



Fig. 3: Symptoms of gummosis affecting the main branches of Almonds trees of Nomal Valley (Courtesy Riaz Paras)



Fig. 4: Symptoms of gummosis affecting the main branches of apricot trees of Chalat Valley (a) Cankers (b) Gum exudation

Cherry fruit become prolific gum producers in particular rainy days followed by peach, apricots, almonds and plum. The diseases enter through wounds or lenticels on the branches, twigs and main trunks of fruit trees. Lenticels are breathing holes in twigs, branches and main trunk and these are entry points for the plant pathogens. Around the lenticels and injuries small, depressed and discolored spots appears. Afterward the area becomes dark and cracked with yellowish or whitish gummy exudation. Yellowing and drooping of leaves are common symptoms in young fruit trees. The disease has significant economic impact in fruit trees orchards. Moreover the disease is continuously reducing the fruit tree longevity and causing considerable losses in GB.

Causes of Gummosis

Plant Pathogens- Fungi, bacteria and viruses have all been involved in causing gummosis [6]. Recently Ezra *et al.* [7] consider gummosis as syndrome of deciduous fruits. The pathogenic bacteria enter through injuries or lenticels and the consequences are the formations of gums. The inoculation of young plum and cherry trees with *Pseudomonas syringae* cause severe gummosis. The fungus *Stereum purpureum* is also known to cause gum formation in stone fruits. In May 2008, apricot trees in the commercial farms of Renai region Taiwan showed symptoms of gummosis disease. The causal agent was a fungus *Botryosphaeria dothidea*. *Botryosphaeria obtuse* and *Botryosphaeria rhodina* have been reported to cause gummosis symptoms in peach tree. Previously the fungi have been reported to cause gummosis in peach trees in

USA^[8]. In 2009 gummosis diseases was observed on apricot trees of Gaotang County in Shandong province, China. Transparent, circular or irregular gums deposits were exuded from the bark lenticles on trunks and branches. The causal agent isolated and identified was *Botryosphaeria obtuse*^[9].

The fungal pathogen which is responsible for gummosis in black cherry *Apiosporina morbosa*^[10]. In another study *Armillaria tabescens* was isolated and identified from the orchard of almond trees of three localities in Greece. Symptoms of gummosis were found on the bark of infected almond trees^[11]. Two fungal species i.e. *Cytospora cincta* and *Cytospora leucostoma* commonly cause canker in black cherry. The canker cause by these fungi is on the most prevalent disease of stone fruits growing regions of the world. Gum ooze from the infection sites of *Cytospora leucostoma* fungus^[12]. *Phytophthora* sp. cause gummosis in citrus and pistachio therefore the role of *Phytophthora* sp. in the gummosis of fruit trees cannot be neglected.

In 2012, five fungal pathogens i.e. *Botryosphaeria dothidea*, *Diplodia olivarum*, *D. seriata*, *Neofusicoccum australe* and *N. parvum* have been isolated and identified from symptomatic tissues of Almond trees of Mallorca Islands (Spain). These fungus are known to cause gummois, dieback and internal necrosis of branches and trunks^[13]. Gummosis can be managed by removing severely infected tissues. Planting seeds from the certified fruit trees. Grafting and pruning should be conducted in late winter or very early spring with sterilized tools. Chemical methods and non-chemical methods such as application of biocontrol agents should be applied to manage gummosis. Disease resistant varieties will be provided by plant breeding institutes to fruit trees growers.

Pests- Pests are also involved in causing gummosis. They hide beneath the barks of trees where they are physically protected from the harsh conditions of environment. Beetles are common in GB and usually attack on weaken or stressed fruit trees. They create holes in barks and as a result fruit trees produce gums in response to attack of these pests. These minute holes also become entry point to plant pathogens. Borers lay egg s on the trunk and branches of fruit trees. The larvas develop from the eggs then bore into the tree which results in deposition of gum near to the injury site. The mining flies are also

considered to be potential cause of gummosis in fruit trees. The larva of mining flies bore through the cambium of fruit trees and cause gummosis. Additionally, in late summer, cicadas are seen on the branches of fruit trees. They may cause the trees vulnerable to attack by other pests and diseases. These pests can be controlled by both cultural and chemical methods to prevent the plants from gummosis.

Climatic conditions- Gilgit-Baltistan (GB) is mountainous regions and trees are usually grown on ridge tops or on the tops of hills. Therefore the fruit trees grown in these exposed areas become more susceptible of damage caused by high winds snow and ice. Moreover the application of Nitrogenous fertilizers is too much high as compared to other fertilizer suggesting gum formation. Grafting and pruning with the unhygienic tools may enhance gummosis disease of fruit trees. Gummosis in fruit trees of GB is also associated with the high rainfall in the recent years due to global climatic change.

CONCLUSIONS

The causes of Gummosis in fruit trees in Gilgit Baltistan (GB) are still unknown. There is need to isolate and identify the pathogen based on molecular markers. The area is one of the remote areas of Pakistan and there is no sophisticated plant pathology Lab where the pathogen will be isolated and identified. This is a preliminary report based on depositions of gums and cankers on the fruit trees of GB. Moreover the pathogenicity test should be conducted to verify the actual causal agent of gummosis disease. Further research is required regarding the etiology and epidemiology of the gummosis. There is no such plant breeding institute which can provide disease free nursery stock and varieties to the fruit trees growers. To manage the diseases, the fruit tree growers should select proper site for the establishment of fruit tree nurseries to prevent from the injuries caused by high winds. The pests and diseases should be managed by eco-friendly bio-chemicals. In GB the temperature during winter season is very low so to prevent from cold temperature injuries irrigation should be conducted according to the need of fruit trees. Fruits trees should be trained properly to avoid injuries. Proper pruning and grafting should be done at correct time with the sterilized equipment. No chemicals are available in GB to manage

gummosis. However the canker having gummosis can be painted with the available canker paints. The acquired knowledge will be used in the future for the implementation of the most convenient control strategies of gummosis on these tree species. The awareness about the gummosis diseases of fruit trees and proper understanding of the causes of disease is crucial. Pathogenicity trials on fruit trees should be also studied in order to figure out the host range of the gummosis disease.

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CONFLICT OF INTEREST STATEMENT

The present study was conducted in the absence of any commercial or financial relationships that could be considered as a potential conflict of interest.

HUMAN AND ANIMAL RIGHTS

This article does not contain any studies with human participants or animals. For this type of study any constitutional consent is not required. No such studies have been previously conducted in this remote area of Pakistan. The present study has been conducted ethically. If any institution or any other researcher bringing up any issue regarding animals. Public ethics or human rights the author of the present study would be sole responsible.

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