
Injuries to Plants Due to Hail and Frost

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Source: *Bulletin of Miscellaneous Information (Royal Botanic Gardens, Kew)*, Vol. 1909, No. 2 (1909), pp. 53-55

Published by: Springer on behalf of Royal Botanic Gardens, Kew

Stable URL: <http://www.jstor.org/stable/4111606>

Accessed: 27-06-2016 08:44 UTC

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Stamina 3-4 perfecta ; staminodia parva 2. *Flores foeminei* 1-2, basales. *Sepala* 3, pinnatipartita, setosa, ambitu orbicularia, demum 6 mm. longa lataque, laminae parte indivisa ovata, laciniis saepissime 13, lanceolatis, brevibus. *Ovarium* pilosum. *Capsula* setosa, 3-cocca, 6 mm. longa. *Semina* globosa, 4 mm. diametro, brunneo-rubra sed pallide marmorata.

RHODESIA. Gwelo, *Gardner*, 34.

1010. *Gladiolus subaphyllus*, *N.E. Br.* [Iridaceae] ; affinis *G. parvulo*, Schltr., sed elatior et subaphyllus cum floribus minoribus differt.

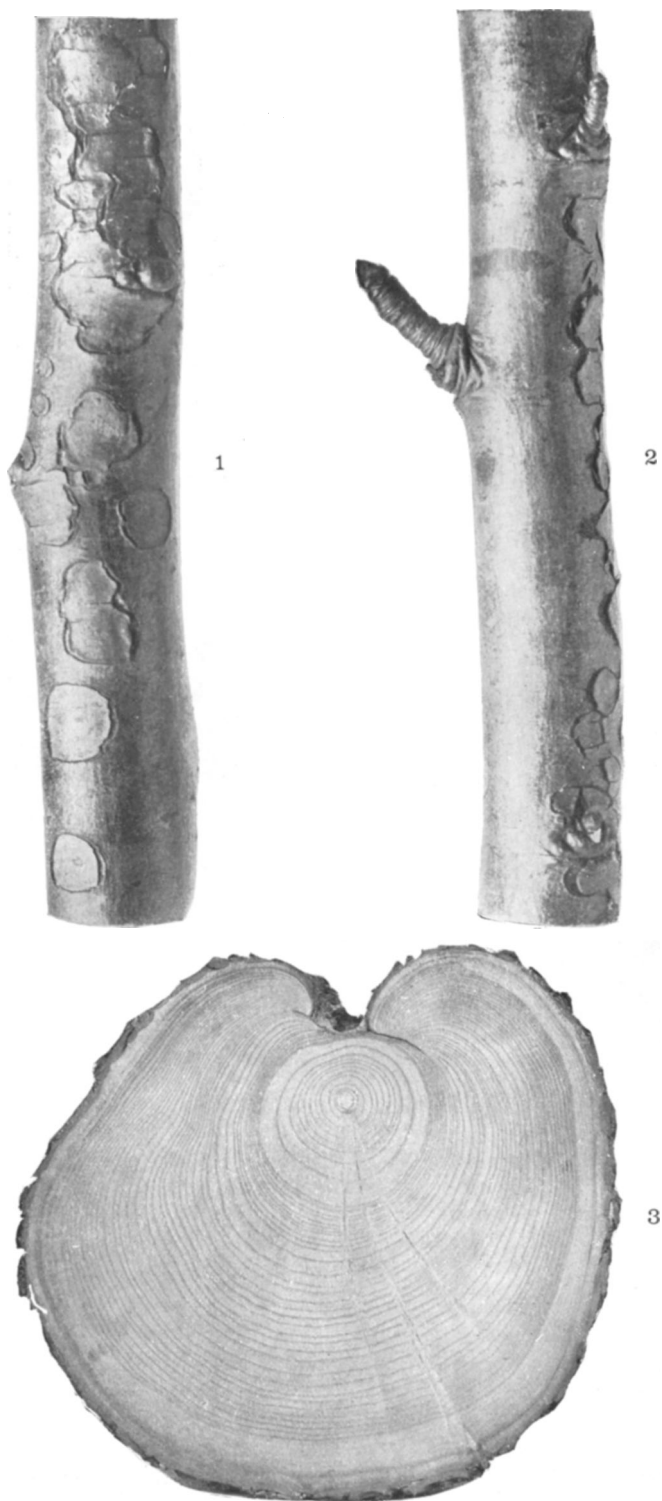
Cormus 1-1.2 cm. diam., tunicis fibrosis vestitus. *Planta juvenilis* unifoliata ; folium 9-12 cm. longum, 2.5-3 mm. latum, lineare, acutum, pilis patentibus laxe piloso-pubescens, marginibus incrassatis. *Planta florifera* subaphylla. *Caulis* 24-36 cm. altus, gracilis, glaber, apice 2-3-florus, vaginis duabus arcte investus cum vaginula 5-6 mm. longa arcte convoluta glabra infra inflorescentiam ; vagina inferior 2-3 cm. longa, oblique truncata, glabra ; vagina superior ad medium caulem attingens, 12-18 cm. longa, laxe patente pubescens, sulcato-striata, apice in acumen appressum subulatum vel lineari-attenuatum compressum acutum liberum 3-6 mm. longum producta. *Bractae* aequales, 9-11 mm. longae, 4 mm. latae, oblongae vel elliptico-oblongae, subacutae. *Perianthium* infundibulare, 2-2.2 cm. longum, subregulare, album, carneo-tinctum ; tubus 5-6 mm. longus ; segmenta subaequalia, 15-16 mm. longa, 6 mm. lata, lanceolata, acuta. *Stamina* glabra.

NATAL. Zwartkop, at 1,200-1,525 m., *Wood*, 10153.

VIII.—INJURIES TO PLANTS DUE TO HAIL AND FROST.

G. MASSEE.

The injury to foliage and flowers caused by hail is well known ; the fact that an equal, or perhaps greater amount of damage to the bark of trees is due to the same cause, is not so generally realised, the wounds formed being often attributed to frost, insects or fungi. Young trees, or the young branches of older trees suffer most, especially those kinds possessing a smooth bark. The injury caused is greatest during the early summer months, when the trees are in full growth, as at this time the bark is soft and most easily injured by bruising. The accompanying plate illustrates two portions of the branch of a pear tree that was injured by hail during the summer of 1908, and photographed the following January. Towards the lower end of the left hand figure (fig. 1) the injury caused by single hailstones is seen. The upper portion of the same figure illustrates the effect produced by several hailstones striking the branch at points near to each other. The right-hand figure (fig. 2) shows the sheltered side of the same branch, which is free from wounds. The injury being confined to one and the same side of a branch, along with the more or less circular form of the isolated wounds, are factors characteristic of injury due to hail. When soft



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bark is struck by a hailstone with moderate force, the bark is completely crushed and disorganised at the point of contact, and soon becomes dead and dry, contracting at the same time and breaking away from the surrounding living bark. Owing to this contraction, a fissure is formed separating the dead from the living portion, which too frequently enables the spores of different kinds of parasitic fungi to gain an entrance into the living portion of the branch, and complete its destruction.

It rarely happens in this country, that hailstones do a greater amount of damage to trees than indicated above, but in tropical countries where such storms are very severe, the amount of injury done must be immense. Under such conditions I have seen galvanized iron roofing perforated by hailstones as readily as if it had consisted of paper.

In speaking of the damage done to trees, Hartig says* :—" At places where the hailstones strike the rind is crushed, or it may be knocked off altogether. Although as a rule, a callus very soon forms over such wounds, still it not infrequently happens that the injured portion of the stem dies. In young spruce woods in the neighbourhood of Munich, I found that the leading shoots which were affected by hailstones died—a result doubtless due to the excessive evaporation from the wood, which in many cases was stripped of its cortex on one side of the shoot to the distance of about an inch."

Spring frosts.—These are, with much reason, dreaded by those concerned with the cultivation of plants. Many kinds of plants that survive without injury severe winter frosts, succumb to a comparatively slight frost after growth has commenced. This difference depends on the relative amount of water present in the tissues during different seasons of the year. When active growth commences the leaves and youngest shoots contain a considerable amount of water. During a late spring frost water is abstracted from the cells into the intercellular spaces, more especially under the epidermis of leaves and shoots, where it freezes into parallel prismatic crystals. The withdrawal of water from the cells of a leaf causes it to droop and exhibit the well known symptoms of the effect of frost. The recovery or death of a frozen leaf depends mainly on the precise manner in which thawing takes place. If the process is gradual, allowing the water to be reabsorbed by the cells as it thaws, little or no injury is sustained, whereas if the thaw is sudden, due to bright sunshine early in the day following a sharp frost, the rapidly liberated water floods the intercellular spaces, instead of being absorbed by the cells, and the death of the organ results. When actively growing leaves are frozen late in the spring, the epidermis of the under surface is often completely torn away from the remainder of the leaf, and hangs like a blister. Cabbages are often injured in this manner. The young leaves of evergreens also suffer in a similar way.

Frost cracks.—These are longitudinal cracks of variable length in the bark and wood of tree trunks, and are the result of a great and sudden lowering of the temperature. In this instance water is

Hartig and Somerville, " Diseases of Trees " ; Engl. ed., p. 299 (1894).

withdrawn from the cell-walls, and freezes in the cavities of the cells. Owing to loss of water from the cell walls, the cells shrink, and a crack is the result. When the temperature rises the cell-walls re-absorb the water, causing the cells to expand, and the crack closes more or less. The subsequent formation of callus completes the work of closing the wound. It not infrequently happens that an old frost crack, being a weak point, is reopened by succeeding frosts. As a rule little direct injury results from frost cracks, in the case of our native trees, but they often enable parasitic fungi to gain a foothold. When a frost-crack is completely healed, the callus formed from the two edges of the crack meets and forms a more or less projecting ridge, known as a frost-rib.

Sub-tropical trees often suffer severely from frost when grown in this country, even when not at first killed outright. *Catalpa bignonioides*, Walt., an ornamental tree, a native of the Southern United States is often injured by frost when growing in England or in the New England States. A very fine specimen at Kew, about sixty years old, recently succumbed from the cumulative effect of frost. The tree had two tiers of three more or less horizontal branches each. When the branches of the upper tier were about forty years old, each one was injured by a severe frost-crack throughout its entire length. These wounds never completely healed, as shown in the accompanying photograph (fig. 3), and afterwards no more shoots were produced on these branches, the result being a scarcity of leaves, which resulted in the crown of the tree being literally starved to death, owing to lack of food and water. The lower tier of branches, being sheltered by the upper ones, was perfectly healthy, and carried an abundance of foliage and flowers when the tree was cut down.

Something can be done to protect plants that have been caught by a spring frost. They should be protected by a covering of some kind—sheets, straw, &c.—from the sun's rays, so that they may thaw gently and gradually. When the covering method is impracticable, a thorough spraying with cold water is often effective in preventing rapid thawing.

In the case of frost-cracks or injury caused by hail, the wounded parts should be sprayed with Bordeaux mixture at intervals until a callus is formed.

IX.—LALANG GRASS.

(*Imperata arundinacea*, Cyrill).

J. M. HILLIER.

Attention has recently been drawn to this plant as a source of paper-making material. It is a common plant in tropical countries and has been described as a pestilent weed, which once allowed to invade a plantation, can only be eradicated at enormous expense; it is ubiquitous, always one of the first weeds to cover newly opened land, and by far the most difficult to eradicate.

Imperata arundinacea proper has a creeping rootstock with solid stems of 1 to 3 ft. and glabrous or bearded nodes, leaves erect, often