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Physiological Plant Disorders:A Study

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Abstract

India is second only to China when it comes to global fruit production. India has the potential to become a global leader in the cultivation of perennial fruits. Some of the most important include the jackfruit, coconut, sapota, bael, ber, cashew, aonla, pomegranate, litchi, guava, citrus,andaonla. Fruits of this economic value might be sent all over the globe. They ensure the fruit producers will have a reliable source of revenue while also contributing to the safety of the nation's food supply. Consequently, reducing waste at each of its multiple points of origin is crucial for increasing production rates and standards. Scientists have speculated that abiotic variables are to blame for as much as 70 percent of the global loss in agricultural production. India is the second largest grower of fruits worldwide, yet the country's production is dismally low. Woody perennial fruit crops are impacted by both genetics and environmental factors in their physiology and ecology. In India, the main reasons for low fruit crop yield are not biotic issues but rather alternate bearing, unfruitfulness, fruit drop, fruit cracking, sun-burn or scorching, malformation, wilt, granulation, and deformities. Alternate bearing, lack of fruit, fruit drop, fruit breaking, sun scorch, malformation, wilt, granulation, and deformities are all examples of such conditions. Agricultural productivity throughout the globe is heavily impacted by a number of abiotic factors that also contribute to other issues. harmful changes in plant structure, function, and biochemistry that stunt development. This is already a difficult undertaking, and it becomes exponentially more so in a climate change scenario that includes many ecological stress factors, such as a rise in ambient temperature and a drop in soil osmotic potential owing to an uneven, irregular, and unpredictable rainfall pattern. Cellular damage and abnormalities in the physiological processes happening within the plant body as a result of unfavourable climatic settings are likely causes of output shortfalls in tropical and subtropical perennial fruit crops. Both the above-ground structure of the plant and its root system are affected by environmental and edaphic conditions, as well as genetic predispositions, which may lead to physiological challenges.

Keywords: *Physiological challenges, Plant Disorder,Indoor plant, Technostress, Psychological and physiological effects.*

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Introduction

A lack of light, unfavourable weather, waterlogging, phytotoxic chemicals, or an insufficient supply of nutrients are all examples of non-pathological situations that may lead to physiological plant diseases. Pathogenic organisms are the root cause of plant pathology. These conditions disrupt the regular functioning of the plant's internal systems. It's important to distinguish between illnesses of plants caused by external agents like a virus or fungus and those caused by physiological anomalies created internally by the plant itself. The signs and symptoms of physiological abnormalities may be misdiagnosed as those of diseases; but, in the vast majority of cases, the symptoms may be avoided by altering one's environment. However, once a plant exhibits symptoms of a physiological disorder, it is quite probable that its development or productivity would be limited for the remainder of that season. The plant's current precarious state is to blame. Delayed physical development and a host of other health problems, including chlorosis, have been linked to nutritional deficiencies (a yellowing of the leaves). It is possible that the soil (or other growth medium) may not contain enough of a certain nutrient, or that the nutrient is present but in an inaccessible form, leading to insufficient absorption by the plant. It is possible that both of these things are contributing to the issue. Causes of the latter include fertiliser overload, low water availability, inadequate root development, and an unbalanced soil pH.Possible causes include insufficient attention to root growth. On-site expert consultation, soil and plant-tissue testing services, prescription-blend fertilisers, the application of fresh or well-decomposed organic matter, and the use of biological systems like cover crops, intercropping, improved fallows, ley cropping, permaculture, or crop rotation are all effective means of preventing and correcting plant nutrient deficiencies. Prescription-blended fertilisers, specialised testing of soil and plant tissue, and expert advice from a gardening expert all contribute to these practises. Growing different types of crops each year is another option to consider.

Literature Survey

MalvikaRanjan and her colleagues proposed a method to identify diseases in plants by making use of a picture that was taken of a damaged leaf. The title of their research article was "Detection and Classification of leaf illness using Artificial Neural Network," and it was titled "Detection and Classification of leaf illness." The use of an Artificial Neural Network (ANN) that has been trained via the thoughtful selection of feature values is required before unhealthy plants can be distinguished from those that are healthy. In terms of precision, the ANN model achieves an accuracy rate of 80 percent.

In their research titled "Applying image processing technology to detect plant diseases," Kulkarni and coauthors provided an approach for the rapid and precise diagnosis of plant diseases utilising artificial neural networks (ANN) and other image processing techniques. Since the proposed approach employs an ANN classifier for classification and a Gabor filter for feature extraction, it is capable of providing top-notch results, with a recognition rate that might reach 91% in certain cases.

Godfree and Farrell researched wastewater pathogens (2005). Pathogen range and amount vary by endemic sickness, commercial pollutants, and season. Treating wastewater reduces disease transmission. Combined with sludge solids. Many treatment strategies don't fully understand the mechanics of microbial inactivation, whereas others are designed to kill diseases. In the U.S. and Europe, land application of biosolids is restricted because of many challenges to controlling the spread.(i)treatment to reduce biosolids' pathogen content and attractiveness, (ii) constraints on the sorts of crops that may be grown on biosolids-treated land, and (iii) minimum time periods between biosolids' application and subsequent grazing or harvesting. Were Pathogen risk management requires entire sludge treatment, biosolids handling and application, and post-application activity supervision. Hazard analysis and critical control point-based quality management systems may assist.

Tee et al. (1999) examined the danger of spreading weeds as well as plant diseases by recycling green garbage (municipal waste plant material) during a 2-year period at 6 locations in Melbourne, Australia. They comprised trials to examine the survival of Plasmodiophorabrassicae, Sclerotiumrolfsii, Tobacco mosaic virus, Armillarialuteobubalina, and Sclerotiniasclerotiorum. Variable compost heap conditions affect the process's capacity to destroy plant diseases. They concluded that efficient turning was needed.Heat green garbage for 3 days at 55 ºC

Plant pathology

A plant disease is a disturbance in the normal state of a plant that either causes the plant's essential activities to cease or causes the processes to modify. It is possible for plant diseases to be passed on from one plant to another. Any kind of plant, regardless of where it was grown (in the wild or in a greenhouse), is susceptible to contracting various diseases. In spite of the fact that every species is susceptible to certain diseases that are specific to that species, the prevalence of these ailments is often rather low. The frequency of occurrence and the level of prevalence of plant diseases varies from season to season. These changes are brought on by a variety of reasons, some of which include the presence of the pathogen, the conditions of the environment, as well as the sorts of crops and plants that are being farmed. Some plant species are more susceptible to the spread of illness than others, while others have a greater capacity to tolerate the negative impacts of infectious diseases.**(Kumar, Madan, Söll, Dieter ,2000)**

Nutrient Deficiencies

One condition that may occur when plants don't get enough of what they need to flourish is chlorosis, which manifests as yellowing of leaf tissue. Another effect of this is to slow the plant's development. Lack of a nutrient in the soil (or another growth medium) may prevent plants from getting enough of that nutrient, as can the availability of the nutrient in a form that is inaccessible to the plant. Inadequate nutrition absorption may result from any of these situations. Either of these two possibilities is plausible. A pH imbalance, a lack of water, a lack of root development, or an excess of one or more nutrients might have all contributed to this second issue. All of these are just guesses as to what may be going on. Cover crops, intercropping, improved fallows, ley cropping, permaculture, and crop rotation are just a few examples of biological systems that may be utilised to either prevent or correct nutrient deficiencies in plants. All of these techniques are complementary, and may be utilised together to great effect. Additionally, it is possible to use techniques such as consultations with on-site specialists, the use of soil and plant-tissue testing services, the application of prescription-blend fertilisers, the application of fresh or well-decomposed organic matter, and the application of prescription-blend fertilisers. In-person meetings with experts, the use of custom-blended fertilisers, the introduction of newly-created or thoroughly decomposed organic matter, and the use of custom-blended fertilisers are some other options.

1. Boron deficiency (plant disorder)

Boron deficiency is a condition that may develop in plants if they do not receive enough of the vitamin boron, which can cause the plant to suffer from a lack of boron. Boron insufficiency can also arise when plants do not get enough water. It is the deficiency of micronutrients that is the most widespread issue that can be seen all across the globe. This deficiency is to blame for significant reductions in the amount and quality of the crops that are farmed. If there is an inadequate quantity of boron in the soil, it is possible for both the vegetative and reproductive development of plants to be stifled. Because of this, there is a possibility that cell proliferation will be inhibited, the meristem will be lost, and fertility will be reduced. It is not impossible for plant tissues to have both a version of the element boron that is water soluble and one that is water insoluble**. (Koshiba, , Kobayashi, &Matoh 2009)** When more boron is delivered to entire plants, there is no change in the quantity of boron that is water-insoluble; nevertheless, there is a change in the amount of boron that is water-soluble when more boron is supplied to whole plants. Boron insufficiency manifests itself as a simultaneous reduction in the amount of boron that is water-insoluble in the body. This is due to the fact that boron may be dissolved in water. Boron may be found in two distinct configurations, one of which is insoluble and the other of which is soluble. The insoluble form is the one that fulfils a function, while the soluble form is an unnecessary surplus***.(Marschner ,1995).***

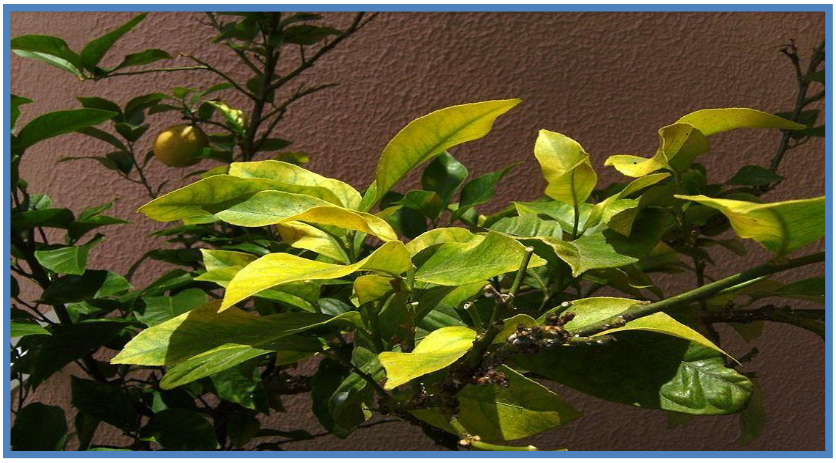
2. Calcium deficiency (plant disorder)

Low transpiration from the entire plant or the afflicted tissue is the most prevalent cause of calcium (Ca) shortage in plants. However, an inadequate quantity of physiologically accessible calcium in the growth medium may also induce this condition. There are two possible causes of calcium (Ca) deficiency: insufficient Ca in the diet or too much Ca in the growth media that is unavailable to the plant. Lack of calcium in the medium in which the plant is growing might also lead to a lack of this essential nutrient. Calcium deficiency (Ca) refers to an abnormally low blood calcium level (C). As calcium is not transported via the phloem of plants, it is conceivable for plants to acquire localised calcium deficiencies in tissues that do not transpire or have low rates of transpiration. This is due to the fact that plants do not transport calcium via their phloem. Possible causes include insufficient water, which prevents calcium from being transported to the plant, inadequate stem calcium absorption, or an overabundance of nitrogen in the soil. This might also occur if there is an excessive amount of nitrogen in the ground.***(Tang, Ren-Jie; Luan, Sheng 2017; Simon 1978)***

Calcium roots loss (blossom end rot) on a tomato

3. Iron deficiency (plant disorder)

There are two names for the same condition: ferrous (Fe) deficiency, which causes harm to plants, and lime-induced chlorosis, which is another name for the same disorder. Distinguishing this illness from manganese insufficiency is crucial. Since iron is necessary for the synthesis of chlorophyll, a condition called chlorosis may occur in plants if they do not get enough iron. The soil has a high quantity of iron; nevertheless, if the soil's pH is more than 6.5, the iron may become inaccessible for absorption. The earth itself contains the necessary iron. Iron deficiency in plant tissues may result from an overabundance of manganese or other elements in the soil. Iron insufficiency is the name for this issue. Chlorosis, which causes a yellowing of the foliage, is more common on the newly developing leaves than on the older ones. The interveinal zone of a plant is often the site of this disorder. The fruit's production and quality would both decline. For example, 5-aminolevulinic acid, a precursor of heme and chlorophyll, cannot be made without iron. Iron is required for the catalytic reaction to take place in the active site of glutamyl-tRNAreductase. 5-Aminolevulinic acid cannot be made without this enzyme. Chlorosis develops in younger leaves because iron is a non-mobile element. Since of this, chlorosis develops in younger leaves because they can't get enough iron from the rest of the plant. As a result, chlorosis sets up among the younger leaves. If left untreated, the yellowing might spread and become white, or the whole leaf can wilt and die. **(Eroglu, Seckin, Meier, Bastian, von Wirén, Nicolaus,Peiter, Edgar (2016). Kumar, Madan,Söll, Dieter (1 January 2000).**



Lemon tree chlorotic from iron lack. Compare yellow chlorotic leaves to green non-chlorotic leaves.

4. **Magnesium deficiency**

A plant with magnesium deficiency

Lack of magnesium in the body causes an electrolyte disruption known as magnesium deficit. If magnesium is lacking in the diet, this may occur. Many different symptoms might be present. Personality shifts, shakiness, coordination problems, muscular spasms, and a lack of appetite are just some of the symptoms. Nystagmus is another sign that something is wrong. Seizures and cardiac arrest due to conditions like torsade de pointes are potentially possible complications. Magnesium deficiency is almost often accompanied by a decrease in potassium levels. Some factors that might lead to this sickness include intoxication, diarrhoea, excessive urine loss, diabetes, and poor nutrient absorption in the gut. Magnesium depletion may also be caused by the use of other drugs, such as proton pump inhibitors (PPIs) and furosemide. Diagnosis is often predicated on the finding of low blood magnesium levels (hypomagnesemia). Magnesium levels below 0.6 mmol/L (1.46 mg/dL) are considered to be hypomagnesemic, whereas the normal range for magnesium levels is between 0.6 and 1.1 mmol/L (1.46-2.68 mg/dL). Magnesium deficiency may cause or contribute to insulin resistance, a condition that often precedes diabetes. Magnesium deficiency has been linked to increased insulin resistance because of its central involvement in glucose metabolism.**(Viering, Daan, Baaij, Jeroen , Walsh, Stephen ,Kleta, Robert;Bockenhauer, Detlef 2016;Kobrin, Goldfarb, 1990;Upala, Sikarin, Jaruvongvanich,Veeravich; Wijarnpreecha, Karn; Sanguankeo, Anawin 2016).**

Molybdenum deficiency (plant disorder)

It is possible for a plant to have a molybdenum (Mo) deficiency if the plant is unable to take in enough of this vital element from its surrounding environment, which in turn causes the plant's development to be stunted. This condition is known as molybdenum deficiency. This may be the result of low concentrations of molybdenum in the soil (which would indicate that the soil's parent material contains a low amount of molybdenum), or it may be the result of the molybdenum in the soil being stored in forms that are inaccessible to plants. Both of these scenarios are possible (sorption of Mo is highest in acid soils). The majority of plant sections that display signs of molybdenum insufficiency also exhibit nitrate buildup. This is because molybdenum and nitrate work together to cause these symptoms. This disorder develops when there is a deficiency in the quantity of the enzyme nitrate reductase in the body. The following is a sample of the indications that were found: The leaves are papery and have a condition called chlorosis, which gives them a yellowing appearance, and a condition called necrosis, which gives them a scaling appearance, along the veins and around the margins. whiptail disease is a pathogen that affects Brassica plants, most often cauliflower; There has been a decline in the production of tasselled maize; a condition that manifests itself when maize kernels sprout before their intended time.**(Camlin, Russell ,2007;*Mengel, Konrad, Kirkby, Ernest 2001)***

1. **Nitrogen deficiency**

Drought

If there isn't enough nitrogen for plants to use, we have a nitrogen shortage. One organic material with a high carbon content that might have this effect if applied to soil is sawdust. Soil organisms utilise available nitrogen to speed up the degradation of carbon sources, cutting off supply to plants. Commonly, this is referred to as "robbing" the soil of its nitrogen content. Nearly all vegetable species might be affected by this disease, with the exception of legumes due to their ability to fix nitrogen. Nitrogen deficit is detrimental to plant development, but it may be avoided by applying manure to the leaves of plants or mulching with grass clippings. Planting green manure crops like grazing rye or winter tares to cover it over the winter might lessen the amount of nitrogen lost from the soil. Winter tares, a kind of leguminous green manure, may also be used to fix atmospheric nitrogen.**(Pandey, Sinha, & B K November 2009).**

2. **Phosphorus deficiency**

Phosphorus deficiency on corn

Phosphorus deficiency is a condition that develops in plants when there is not enough phosphorus in the soil. Phosphorus refers to a group of compounds that includes the salts of phosphates, monohydrogenphosphate , and dihydrogen phosphate . The pH of a solution or soil determines which anion species is more numerous, however they may readily exchange with one another. Biosynthesis of ATP and DNA both need phosphates, which are also necessary for life. Phosphorus may be obtained from a variety of resources, including bone meal, rock phosphate, manure, and phosphate fertilisers. To a plant's overall health and production, phosphorus (P) is second only to nitrogen. Photophosphorylation, genetic transmission, nutrition transport, and phospholipid cell membranes are all processes that need phosphorus in plants. Photophosphorylation is one example of a crucial cellular activity that allows plants to store energy created by sunshine. At the cellular level, phosphorus plays a crucial part in the process of cell division. The inability to express genes, such as those responsible for cell division and plant growth, is slowed by a lack of phosphorus. As a result, plants that don't get enough phosphorus could not reach full maturity as quickly as those that do. The restricted development induced by phosphorus deficit has been related to smaller leaf widths and fewer leaves. Carbohydrate storage may also be influenced by phosphorus levels. Photosynthesis, in which plant cells use water and carbon dioxide to transform solar energy into chemical fuel, proceeds normally even in a phosphorus-deficient environment. However, phosphorus-dependent cellular functions often move at a snail's pace. Because of this mismatch in rates, extra carbohydrate accumulates in phosphorus-deficient plant tissues. The darkening of leaves is a common indicator of carbohydrate accumulation. The process may cause a shift in leaf pigmentation that makes the leaves of certain plants seem dark purple.

3. **Potassium deficiency (plants)**

Potassium-deficiency symptoms on a tomato leaf

Because potassium ions (K+) are more soluble in the absence of colloids, potassium insufficiency, also known as potash deficiency, is more prevalent in light, sandy soils. Soils that are poor in clay, that are calcareous, or that are peaty may have potassium deficiencies. In addition, it grows in poorly cemented, heavy clays. Symptoms of potassium shortage in plants include chlorosis (yellowing between leaf veins) and brown scorch scars on leaf tips. Undersides of leaves may become a purple colour under several circumstances. In the absence of potassium, plants often fail to thrive, exhibit stunted root growth, and are unable to produce fertile seeds or fruit. Because potassium is mobile, older (lower) leaves may be the first to show signs of K deficit, prompting the plant to reallocate potassium to younger leaves. Deficient plants are more likely to be damaged by frost and susceptible to disease, yet their symptoms are commonly misunderstood as wind scorch or dryness. Potatoes, brassicas, tomatoes, apples, currants, gooseberries, and raspberries are some of the most widely consumed crops and fruits that are affected by the shortage. Commonly impacted crops include sugar beets, grains, and clover. There is a chance that any or all of the following symptoms may be present in any of these plants: Both the tuber size and crop production are drastically diminished. Interveinalchlorosis, which causes a bluish green coloration, gives the impression that the plant's leaves have died. The top surfaces of the leaves will become a golden hue, while the undersides will develop tiny dark dots. Usually, the leaves of brassicas have a blue green hue, and interveinalchlorosis may occur. Due to the sluggish rate of development, the leaves might feel harsh and develop burn lines on the outside margins. Tomato plants are notorious for their sluggish growth and subsequent woody branches. In most cases, the veins and vein axils on these leaves gradually fade to a softer grey, while the rest of the leaf is a brilliant blue-green. It's possible that some leaflets may develop yellow and orange patches, giving the leaves a bronzed appearance. Common problems include erratic ripening and the occasional greening of fruit stem tips.**(Viering, Baaij, Jeroen, Walsh, Stephen, Kleta, Robert; Bockenhauer, Detlef 2016)**

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4. **Zinc deficiency (plant disorder)**

Poor absorption of zinc from the soil is a leading cause of stunted plant growth, which is one of the symptoms of zinc insufficiency. Reduced crop yields and poorer quality food are attributable to a worldwide shortage of micronutrients in soil and forage. Symptoms include chlorosis (leaf yellowing, usually interveinal), necrotic patches (death of leaf tissue in chlorotic areas), and reduced growth. Chlorosis causes the leaves to become yellow (often interveinal). Spots of chlorosis on leaves might change to a golden colour; Dwarf leaves, often known as "little leaves," are abnormally small leaves that frequently display chlorosis, necrotic spots, or bronzing. Conversely, abnormal leaves tend to be thinner or have uneven margins. Zinc deficiency induces rosetting, the gathering of leaves on the stem, by shortening the internodes of dicotyledonous plants.**(Tang & Luan 2017)**

Weather damage

Frost and frost are the most common causes of crop loss in sensitive plants; nevertheless, they are also the ones that may be avoided with the greatest ease. However, even hardy plants run the risk of having their harvests harmed if the new growth that has sprouted after a period of warm weather is then exposed to a severe frost within the same time period that the mild weather was present. It is quite unusual for the symptoms to abruptly present themselves, and a wide variety of plant species will be impacted by the condition. In the case that the plant is damaged by frost, the buds and blooms may take on a look that is discoloured, and the leaves and stems of the plant may become black. If the plant's blossoms are frozen, there is a chance that the plant will not yield fruit the next year. When the temperature outside falls to below 40 degrees Fahrenheit, there is a possibility that many annual plants, as well as plants grown in areas that do not typically experience frost, may suffer damage. This is also the case with plants that are grown in areas that do not frequently experience heat waves. This is due to the increased likelihood of these plants succumbing to their conditions (4 degrees Celsius). When the temperature falls to between 5 and 9 degrees Celsius, which is equivalent to 42 to 48 degrees Fahrenheit, there is a chance that tropical plants may begin to show signs of cold damage. This can happen when the temperature is between 5 and 9 degrees Celsius. These signs include a blackening or weakening of the plant tissue, as well as withering of the tips of the stems and/or leaves. In addition to these symptoms, the plant tissue will eventually become black. It is possible to protect tender plants from the harmful effects of frost or cold by ensuring that the plants have been properly hardened prior to planting and by ensuring that the plants are not planted too early in the season, before the threat of frost has passed. In this way, the plants will be protected from the damaging effects of frost or cold. It is advised that frost-sensitive plants not be grown in areas where they would be exposed to early morning light or in pockets of frost. Both of these conditions increase the risk of frost damage. These two factors together increase the probability of frost damage occurring. When there is a chance of frost, the buds and blooms of young plants should be covered with horticultural fleece in order to prevent damage from the cold. Even if there isn't a real frost, winds coming from the east that are dry and cold have the ability to dramatically inhibit the development of springtime vegetation. As a consequence of this, it is of the utmost importance to provide a suitable level of protection and to make use of windbreaks. Wilting and other symptoms of water stress, such as various indicators of water stress, may appear on plants that have been subjected to dry conditions. At all times, but particularly during extended periods of hot and dry weather, an adequate quantity of irrigation is necessary. In the event that there is a drought, you should not water your lawn or garden for an extended period of time each day; rather, you should concentrate on maintaining a wet surface. Instead, water should be directed into the roots, and the soil should be fully saturated twice or three times each week. This should be done. This ought to be done in a consistent manner. Not only do mulches assist in the soil's ability to hold onto moisture, but they also play a role in protecting the roots of the plant from being too hot. The roots of plants have the potential to break apart as a result of heavy rainfall, especially after extended periods of drought. This risk is increased when the drought was severe. In addition, heavy rains may cause saddleback, which is a splitting at the base of the onion; splitting of tomatoes; and deformation of, or hollowing in, potatoes. Tomatoes can also split when they are subjected to heavy rainfall. The use of mulches or the addition of organic matter to the soil, such as leaf mould, compost, or manure that has been given sufficient time to decompose, may help to function as a "buffer" between rapid changes in the environmental conditions that are currently present. This is because organic matter takes longer to break down than inorganic matter does. Compost, leaf mould, and manure that has been allowed sufficient time to degrade are some examples of organic waste that have reached this stage. Soils that do not drain well face the danger of getting waterlogged, and this is something that is more likely to take place after a stretch of time during which there was continuous or strong rainfall. Plants run the risk of becoming yellow, being stunted, and developing a greater propensity to be more susceptible to dryness as well as infections. There is also the possibility that they may die. Enhancing the effectiveness of the drainage system is going to be of great assistance in reducing the negative effects that are going to be caused by this issue. **(Russell 2007)**

Conclusion

The pathogen should be kept at a safe distance from the growing host plant in order to properly adhere to the principles of the exclusion and avoidance strategy. This will ensure that the approach is followed correctly. A common component of this method is the use of chemicals or heat to kill any diseases that may be present on the plant, its seeds, or any other part of the plant before it is harvested. You may give yourself the piece of mind that comes with knowing that the seeds and other planting material you use have been clear of infection if you get them tested and certified. This is a guarantee that is of great value. Before planting, gardeners are required to examine their bulbs and corms, removing and rejecting any plants that seem like they could be infected with a disease and keeping the healthy ones for planting. Plant quarantines, which are also commonly known as embargoes, have been implemented by both the federal government and state governments in order to prevent the spread of diseases into regions that are currently disease-free. This is done in the hope of preventing the spread of potentially dangerous illnesses. Over the duration of this crisis, more than 150 different nations have imposed some kind of quarantine on their citizens.

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