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Agricultural Extension Innovation: Preparation of Booklets and Youtube Videos on Crystal Guava Pests and Diseases

Nur Rokhimah Hanik[1*], Tri Wiharti[1], Anwari Adi Nugroho[1], Agus Purwanto[1]

[1] Biology Education Veteran Bangun Nusantara University, Jl. Sujono Humardano No. 1 Jombor Sukoharjo Indonesia. 57521

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Corresponding Author:
Nur Rokhimah Hanik
nurhanik03@gmail.com

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Abstract: In the digital era, it is necessary to develop an online booklet on crystal guava pests and diseases. Pests and diseases are major constraints on agricultural productivity, disrupting plant physiology and growth, and thus reducing yields. The objective of this research is to develop an online booklet on crystal guava pests and diseases and how to manage them. Data collection was conducted through observation and interviews with owners and managers to obtain information on pests and diseases. Data were analyzed using descriptive qualitative methods. The study identified five pests of crystal guava: fruit fly (Bactrocera dorsalis), ladybug (Epilachna admirabilis), leaf caterpillar (Lepidoptera: Pyralidae), armyworm (Spodoptera litura), and mealybug (Paracoccus marginatus). The diseases identified were: Capnodium citri fungus (sooty mold), anthracnose disease (Colletotricum sp), red rust disease (Chephaleuros virescens), white fungus Fusarium sp, fruit rot disease (Botryodiplodia sp), and leaf spot disease (Cercospora psidii). Crystal guava care is carried out by maintaining garden cleanliness, adjusting plant spacing, fertilizing, spraying insecticides, setting fly traps, and wrapping young fruit. The conclusion of this research can be developed into a YouTube-based booklet as a guide for crystal guava farmers.

Keywords: Booklets; Crystal Guava; Diseases and Pests; YouTube Videos

Introduction

Crystal guava production is often hampered by pests and diseases that can disrupt the physiology and growth of plants and reduce the yield and quality of the fruit ((Misra AK, 2012) and (Raharjo AA, 2017). Pests found in crystal guava plants are Attacus atlas, Setora nitens, Trabala sp., pocket caterpillars, shoot caterpillars, span caterpillars (Lepidoptera); Paracoccus marginatus, Aphis gossypii, guard lice (Hemiptera); grasshoppers (Orthoptera); Bactrocera carambolae (Diptera); and Carpophilus sp. (Coleoptera). (Eriza, at al, 2015). Diseases found and pathogens causing crystal guava are red rust (Cephaleuros sp.), Pestalotia fruit cancer (Pestalotia sp.), anthracnose (Colletotrichum sp.) and pond soot (Triposporium sp.). Several diseases caused by abiotic factors were found, namely fruit bruising (physical impact) and leaf blight (herbicide) (Eriza, at al, 2015) and ((Wahyudi., D, 2019) . The results of research (Hanik.at al) on the identification of pests and diseases in crystal guava plantations in Ngargoyoso sub-district, found several pests and diseases in crystal guava, including: Codot (Cynopterus sp.), fruit flies (Bactrocera dorsalis); leaf caterpillars (Setora nitens), ladybugs (Helopeltis sp.); bagworms (Lepidopthera: Psychide) and shoot caterpillars (Lepidoptera: Pyralidae), mealybugs (Paracoccus marginatus). While the diseases found; nutrient deficiencies (potassium/magnesium); fruit rot by the fungus Collectrichum gleosporioides Penz, fruit cancer (scab) Pestalotiopsis psidii (pat) Mordue, red rust caused by the algae Chephaleurus virescens, wilt disease by the algae Fusarium sp, and the fungus Cercospora psidii. Meanwhile, from the research results (Hanik, 2023) it was found that the Codot pest (Cynopterus spp.), fruit fly (Bactrocera dorsalis); fire caterpillars (Setora nitens, ladybugs (Helopeltis sp.);

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bagworms (Lepidopthera: Psychide) and shootworms (Lepidoptera: Pyralidae). and Koksi beetle larvae, mealybugs (Paracoccus marginatus). Meanwhile, diseases that can be identified are nutrient deficiencies (potassium/magnesium); rot by the fungus Collectrichum gleosporioides Penz, fruit cancer (scab) Pestalotiopsis psidii (pat) Mordue, red rust by the algae Chephaleurus virescens, wilt disease by the algae Fusarium sp, and the fungus Cercospora psidii. Meanwhile, the results of research (Hanik at al, 2024) on the identification of pests and diseases in Helena's garden during the rainy season only found 8 pests and diseases, namely: Codot (Cynopterus spp.), fruit flies (Bactrocera dorsalis), Ladybugs (Epilachna admirabilis), mealybugs (Paracoccus marginatus). Meanwhile, the diseases that can be identified are: White spots caused by the fungus Capnodium citri (sooty mold/Black Mildew), cancer caused by the fungus Pestalotiopsis psidii (pat) Mordue, red rust caused by the algae Chephaleuros virescens, and nutrient deficiencies (potassium/magnesium).

The main obstacle and problem in managing pests and diseases is the lack of knowledge and understanding among farmers regarding the types of pests and diseases that attack crystal guava plants, as well as effective and environmentally friendly control methods. Conventional agricultural extension methods are less effective in attracting farmer interest, resulting in inadequate information dissemination. Novice guava farmers often rely solely on the experiences of previous farmers (Kamsianto, 2024)

Along with the rapid development of information technology, various digital media have emerged as innovative means to convey information and education more widely, quickly, and easily accessible. One form of media that is now widely used is digital booklets (a combination of leaflets and books) and YouTube-based videos. In this study, digital booklets and YouTube-based videos need to be developed because they are able to present material visually and interactively, making it easier for users to understand the information conveyed. This technological development is increasingly relevant in the modern era, where the use of mobile phones has become part of everyday life for people, including farmers. Through these simple and easy-to-operate devices, farmers can access a variety of the latest information, whether related to science, cultivation techniques, pest and disease control, or other social information. The use of digital media is a great opportunity to improve the knowledge, skills, and competitiveness of farmers in facing today's agricultural challenges (Simamora, R.S, 2009). The potential for the presence of educational content on YouTube is one aspect that has not been optimized. Especially YouTube which contains extension videos for farmers (Rahman, D, Mahameruaji, J dan Janitra P., 2018).

The purpose of this research is to compile a YouTube-based booklet of pests and diseases of crystal guava (Psidium Guajava L.) in two seasons as a guide to crystal guava cultivation. The novelty of this research is in the development of digital booklets and videos based on the YouTube platform with the hope that it can be used as a morning extension tool for young farmers (beginners), especially in crystal guava cultivation because it is practical to use. In addition, this YouTube-based booklet of pests and diseases of crystal guava (Psidium Guajava L.) can replace the traditional extension process, thereby reducing energy, funds, distance and time.

Method

Time and place of research

Field surveys were carried out in February and July 2024 in three gardens owned by residents in Dukuh Village and the Helena crystal guava tourist garden in Candi Village, Ngargoyoso, Karanganyar.

Tools and materials

Tools and materials used in this research include: HP: To take pictures/documentation of symptoms on plants due to pest and disease attacks. 2. Stationery: To record visible symptoms due to pest and disease attacks and record interview results. 3. Research sample: Crystal guava plants from residents' gardens and the Helena crystal guava tourist garden, Ngargoyoso, Karanganyar.

Data Collection Techniques

Type of exploratory or observational research. Data collection in this research used direct observation and interviews. The data collection technique is carried out through several stages, including: (Purwanto, at al, 2024) Prepare the equipment that will be used in the research. Search for and select Crystal Guava plantations owned by residents and tourist gardens to be used as locations and objects for research studies. Observing and recording the types of pests and diseases found in crystal guava plants in the gardens that have been selected as research objects/locations. Identify/observe symptoms on plants affected by pests and diseases found on crystal guava plants. Analyze the symptoms of pest and disease attacks found through interviews and literature review. Interviews were also conducted to find sources of information from plantation owners and managers. Interviews also aim to find and strengthen additional data obtained from observation activities. Development of a YouTube-based booklet based on the identification of plant pests and diseases (Booklet uploaded on YouTube).

Data Analysis Techniques

The collected crystal guava pest and disease data were analyzed descriptively by comparing various literature and the results of interviews with owners or managers of crystal guava plantations. The development of the booklet was carried out with the help of theory/library, referring to (Purwanto, at al, 2024) and (Meidina, at al, 2024) which includes the following steps: 1) Determine the title: Determine the title of the book to be written according to the research objectives; 2) Designing an Outline: Designing a book outline that includes pictures of pests or diseases that attack crystal guava, descriptions or symptoms resulting from attacks, and management of pests or diseases; 3) Collecting References: Collect supporting references to compile the booklet; 4) Booklet Writing: Pay attention to the use of writing in compiling booklets; 5) Booklet Evaluation: Evaluate the results of the writing by re-reading the suitability of the booklet which was prepared as a guide/enrichment for crystal guava farming; 6) Booklet Making: Make a booklet on pests and diseases of crystal guava; 7) Upload to YouTube: Upload the booklet in video form to YouTube.

Result and Discussion

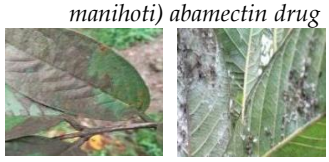
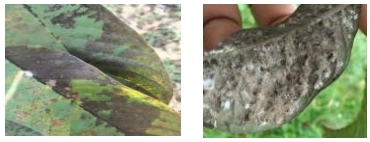
Research result

This research was carried out in January and August 2024. In February (rainy) 11 types of pests and diseases were found, while in the dry season in July 10 types of pests and diseases were found. In previous research (Hanik, 2023) during the rainy season, only 8 types of pests and diseases were found but their distribution was very even on the plants. Meanwhile, in June (Hanik.at al, 2022) 13 pests and diseases were found. The results of the identification of pests and diseases from research in these two seasons can be seen in Table 1.

Figure 1. Field Observation Documentation

Table 1. Pests and Diseases Result of Observation and Identification

No	Appearance on fruit and plants	Pests and Diseases	
		Rainy season	Dry season
1	There are small holes and fruit rot, the fruit is damaged and full of caterpillars (fruit fly larvae)	 Lalat Buah (*Bactrocera dorsalis Hend*)	 Lalat Buah (*Bactrocera dorsalis Hend.*)
2	The leaves have holes because they have been eaten by beetle larvae, there are black spots on the fruit and tops of the leaves. The appearance of the fruit is not good, the selling value is low	 Kepik or kumbang Koksi (*Epilachna admirabilis*)	 Kepik or kumbang Koksi (*Epilachna admirabilis*)
3	Leaves have lots of holes, wrinkled leaf tips look like they are curled (plant shoots)	 Ulat daun (*Lepidoptera: Pyralidae*)	 Ulat daun (*Lepidoptera: Pyralidae*)

No	Appearance on fruit and plants	Pests and Diseases	
		Rainy season	Dry season
4	The leaves have lots of holes, very large holes caused by caterpillar bites	 Ulat grayak (*Spodoptera litura*) and the eggs	
5	On the bottom of the leaves there are threads or lumps like white cotton, over time the leaves will turn yellow and fall off	 Kutu Putih (*Phenacoccus manihoti) abamectin drug*	 Kutu Putih (*Phenacoccusmanihoti)*
6	There are sticky black spots on the leaves which will damage the leaves, disrupting photosynthesis. It comes with mealybugs	 Capnodium citri mushroom (embunjelaga/*Black Mildew*)	 Capnodium citri mushroom (embun jelaga/ *Black Mildew*)
7	Anthracnose disease shows dark brown to black spots on young fruit and in the center of the depression there are black mycelia, on old fruit it becomes hard	 *Colletotricum sp* on guava fruit	 *Colletotricum sp* on guava fruit
8	The surface of the leaves grows brownish red callus or reddish spots, eventually the leaves will dry	 Red rust by the algae *Chephaleuros virescens*	 *Red rust by the algae Chephaleuros virescens*
9	The growth of fungus mycelia which is pink or white. Infected twigs wither over time, dry out and die.	 Guava is attacked by the fungus *Botryodiplodia sp.*	 Guava is attacked by the fungus *Botryodiplodia sp.*
10	Infected fruit is brown starting from the tip near the stalk and irregular in shape. Infected guava fruit will rot and turn black	 Guava is attacked by the fungus *Botryodiplodia sp.*	
11	The round spots are irregular in shape, red in color and the center of the spots is white	 Leaf spot by the fungus *Cercospora psidii*	 Leaf spot by the fungus *Cercospora psidii*

Discussion

Discussion Of Crystal Guava Pests
Fruit Flies (Bactrocera, carambolae)

Crystal guava fruit is damaged and rotten due to fruit fly attack. Fruit flies (*Bactrocera spp*.) are considered the main insect pest of guava which causes a decrease in quality and production during the rainy season (Sharma, at al, 2022) and (Supratiwi, at al, 2020). Based on a survey conducted by *AQIS* (2008) and (Hendrival, at al, 2020), 63 species of fruit flies were found in Indonesia, but only 10 species of fruit flies are known to act as potential pests for cultivated plants. Crystal guava is attacked by several types of fruit flies such as *Bactrocera cucurbitae*, *Bactrocera carambolae*, *Bactrocera umbrosa*, *Bactrocera papaya*, and *Bactrocera albistrigata* (Pratiwi, at al, 2022). The appearance of crystal guava attacked by fruit flies is small holes and black spots on the surface of the fruit, then the fruit will rot due to being eaten by fly larvae. Crystal guava fruit looks smooth on the outside, but the inside is rotten and full of fruit fly larvae (Kariada and Anjarwati, 2022). Fruit flies have the same body size as house flies, elongated, winged and have a slender waist. Fruit fly pests are controlled by wrapping the fruit in polyethylene plastic, the results of the study showed that bagging improved growth, external quality and accelerated fruit ripening. (Romalasari, at al, 2017), or spraying insecticides. Accurate knowledge of the larval host range and distribution of the various fruit fly species is essential for pest management programs and quarantine authorities (Aryuwandari, at al, 2020), (The results of the study showed that bagging improved growth, external quality and accelerated fruit ripening (Carrillo and Pena, 2018).

Farmers can set fly traps (Petrogenol smeared on cotton and put in bottles) (Kamsianto, 2024). The results of (Sharma, at al. , 2022), (Bakara dan Kurniawati, 2020) , and (Hasinu, at al, 2020) study, emphasizing environmentally friendly fruit fly management using methyl eugenol pheromone traps (PAU traps) the results offer one of the most effective methods for fruit fly management especially in the rainy season.

Ladybug or Koksi beetle

Koksi beetles or ladybugs have sucking and piercing mouthparts. Ladybugs attack leaves and shoots, causing black wounds and scars until the fruit ripens. The amylase enzyme is found in the salivary glands of ladybugs. Lipase and protease function to change plant tissue and damage host plants (Sarker, M, and A Mukhopadhyay., 2006) and (Muhlison, 2023). Production of crystal guava can be reduced due to ladybug pests so that the small fruit dries up and turns black, then dies (Avifah, at al, 2017). If the crystal guava continues to grow, the skin will harden and crack, resulting in stunted seed development. Dead shoots are caused by pests attacking plant shoots. Ladybug pests can be reduced by wrapping the fruit in plastic bags, fertilizing regularly, cutting twigs, cleaning host plants, and planting superior seeds. Biological control of ladybug pest attacks by using the natural enemy of ladybugs, namely Beauveria bassiana.

Shoot caterpillars /Leaf caterpillars

Some pests commonly found in crystal guava plantations include hanging caterpillars, leaf caterpillars, span caterpillars (*Lepidoptera*), and others (Eriza, at al, 2015) Shoot caterpillars (*Lepidoptera* : *Pyralidae*) attack young leaves or shoots of crystal guava plants by wrapping several leaves. The larvae of this pest then bite from within the leaf tissue, so that the damage caused is damaged shoots that are covered by fine white threads. Further symptoms caused by this pest are the death of leaf tissue or shoots of guava plants (49. Supriatna dan Hindayana, 2014). Symptoms caused by this pest, in addition to shoots that die due to being stepped on, the larvae also eat young leaves and young twigs from within the folds until the leaves are perforated. (Faridah, 2011). Larvae can also attack young fruit, fruit that is attached to other fruit nearby or on leaves using silk. Larvae eat the fruit on the surface only. The bite marks of this pest will dry up, and will remain until the fruit ripens (Faridah, 2011). Spraying with insecticides affects the abundance of shoot caterpillar pests.

Armyworm (Spodoptera litura)

Armyworm larvae in the young stage are usually green, then gradually change to dark green (Prabaningrum dan Moekasan. , 2022). Insects including armyworms are poikilothermic organisms, meaning that their body temperature is influenced by the temperature of their environment. With increasing air temperature, body temperature also increases and this causes an increase in metabolism in the body. As a result, its life cycle becomes shorter. This condition will certainly make it difficult to control and will increase plant damage and farming losses. According to (Lestari, at al, 2024) as an invasive pest, the population of *Spodoptera frugiperda* continues to increase exponentially, often causing outbreaks. Internal factors (biology) and external factors (weather, hosts, and natural enemies) can affect the growth rate of pest populations.

The control commonly carried out by farmers is by using insecticides at the right dose, so that resistance does not occur in armyworms. (Prabaningrum dan Moekasan. , 2022). Armyworms attack young shoots or leaves, the attack rate is very high compared to other types of caterpillars.

Whitefly (Paracoccus marginatus)

Whitefly (*Paracoccus marginatus*) has a white body and usually has white powder around its habitat. This pest can be found in all parts of the plant, such as young and old leaves, fruit, flowers, and young branches. Symptoms that we can observe in plants attacked by whitefly (*Paracoccus marginatus*) are chlorosis, wilted leaves curling up, and striped fruit. Crystal guava flowers and fruit attacked by whitefly will become dry and black. Nymphs and adult whitefly suck sap from leaves, stems, and fruit and excrete sweet droppings (honeydew) that attract sooty mold and ants (Mani, 2016). Whitefly can attack plant seeds and adult plants. Attacks occur throughout the year but the population is found in greater numbers in the summer months (February–June) (Kariada and Anjarwati, 2022) and (Mani, 2016) the spread of mealybugs is aided by wind, humans, and birds because mealybugs are small and light so they spread easily. The mealybug population is usually controlled by predators (*Cryptolaemus montrouzieri* ladybugs), parasites (*Tetracnemoidea sydneyensis* bees and *T.peregrina)* (Gundappa and Mani ., 2022), and (,Gundappa,at al .20180) alcontrol of this pest can be done using insecticides to make it more practical and efficient (Kamsianto, 2024). However, insecticides do not provide adequate control because of their hidden habitat and wax coating all over their bodies. The use of insecticides can also have negative impacts, therefore it is necessary to carry out natural control, namely by using parasitoids, it is hoped that this natural/biological control can improve the quality of environmentally friendly organic crystal guava production. (Kariada and Anjarwati, 2022).

Discussion of Crystal Guava Disease

Embun Jelaga/Black Mildew/Jamur Capnodium citri

The attack of *Capnodium citri* fungus or known as sooty mold on crystal guava is a fairly common problem in horticultural plants, including guava. This fungus grows on the surface of leaves and fruit covered by honeydew, an excretion from sucking insects such as mealybugs. (Rosemayanti, 2018) and (Mani, 2016) This fungus does not actually attack plant tissue directly, but the black layer it produces can block photosynthesis, which ultimately reduces plant health and productivity.

Sooty mold is more often found on leaves and fruit in humid or tropical areas. The spread of *Capnodium citri* is also supported by the presence of insects that produce honeydew, which is a growing medium for this fungus. Although the direct impact on crop yields may not be significant in quantity, the aesthetic and market value of fruits such as crystal guava can be greatly reduced due to the appearance of the fruit that looks dirty and unattractive. (Lestari, at al, 2024).

Controlling sooty dew can be done by keeping plants clean from insects that produce honeydew, reducing plant branches that grow too high, reducing high sodium fertilization and spraying insecticides. (Kamsianto, 2024) and (Faridah, 2011).

Antraknosa

Anthracnose disease in crystal guava is caused by the fungus *Collectrichum gleosporioides Penz*, characterized by the appearance of black spots on young fruit and developing over the entire surface so that the fruit turns black and rots. Young crystal guava fruit that is attacked shows symptoms of spots that quickly appear and mummification or hardening occurs (Amusa, at al, 2006) (Faridah, 2011), and (Mohammed, at al, 2022). The parts of the plant that are attacked by this disease are young shoots, leaves and fruit. Young shoots show black necrotic symptoms, the tips of the shoots turn dark brown, then spread to the base, causing shoot death. Young leaves become curly and there is dead tissue on the edges of the leaves and the tips are black. At a severe level of attack, it can cause leaves to fall off. Young fruit that is attacked by this disease appears to have small spots the size of a pinhead, which then unite to form large dots, causing the fruit to become hard and corky. This disease attack occurs most often on fruit that is starting to ripen, which often causes spots on the outside of the fruit flesh. At a severe level of attack, it can cause fruit to fall off.

Efforts to control this disease are by maintaining the cleanliness of the garden, especially the environment around the plants, reducing humidity by pruning or widening the planting distance, and spraying with natural fungicides, namely mahogany bark extract, lemongrass and galangal or using synthetic fungicides made in factories whose active ingredients are copper (Cu) Mankozeb, Propineb, Difenoconazole (Firmansyah, , 2015) and (Kamsianto, 2024)

Red Rust

This red rust disease is caused by the algae *Chephaleuros virescens* on the leaves, flowers, fruit, twigs and stems of crystal guava plants. This disease has symptoms on the upper surface of the leaves covered with erect thallus, with yellow or brownish red filaments. Infected leaves are usually located on the edge of the leaf, the edge of the leaf or often spread on the surface of the leaf (Misra, AK, 2004), (Wahyudi., D, 2019) and (Triwidodo, at al, 2021). Spots on leaves usually range from small dots to even large spots; unite or even separate. The spots are round and reddish brown in color. This disease has threads that penetrate the plant tissue that is approached, causing the leaves to appear like velvet. (Misra AK, 2012). Damage to fruit, especially young ones. This disease can cause physical damage,

resulting in decreased fruit quality or even loss of fruit before it is ripe. Untreated red rust infections can lead to drastic reductions in production because plants become weak due to leaf drop and decreased fruit quality. Severe rust disease in young trees can kill shoot tips, and resulting in loss of shoot (Glen. , at al, 2007).

Control of red rust disease can be done by spraying copper oxychloride (0.3%) 3 to 4 times at 15 day intervals until symptoms improve (Misra AK, 2012). Apart from that, you can also use spacing methods that are not close together to reduce the spread of red rust (Kamsianto, 2024), Red rust disease can be reduced by maintaining tree resilience with cultural techniques such as proper fertilization and irrigation, proper pruning to increase air circulation and sunlight penetration, managing weeds, and maintaining wider tree spacing (Merida and Palmateer , 2006) and (Gazis, at al, 2024)..

Wilt Disease

Infected plant parts show symptoms of changing color to yellow, the leaves curl slightly at the base of the branches, become reddish, then the leaves on the branches fall off. Fruits that have formed on infected twigs do not develop, are black, and become hard. After drying, the fruit then faffs off.

The wilt disease symptoms observed showed partial wilting symptoms. From various reports, *Fusarium species* that have been reported to be associated with wilt disease include *Fusarium oxysporum, F. psidii,* and *F. solani* (Gupta, at al, 2010) and (Misra, AK, 2004) Control of wilt disease can be done by planting resistant varieties, implementing good sanitation, removing infected plants, and applying biocontrol (Gupta, at al, 2010) and (Kamsianto, 2024)

Botryodiplodia rot

Affected guava fruit will rot. On the part of the fruit that is attacked, fungal fruit bodies with black spores will form. Fruit rot that enters the flesh and seeds causes the fruit to become soft and watery (Safdar, at al, 2015). This disease is caused by the fungus *Botryodiplodia sp*. The pathogen attacks the twigs or bark of guava plants. *Botryodiplodia sp*. can produce enzymes that cause soft rot. The fungus maintains itself as a saprophyte on twigs and dead bark. In humid conditions, the fungus will form many conidia on dead plant parts. Controls that can be carried out to control botryodiplodia rot disease are garden sanitation, reducing garden humidity, and maintain planting distance (Semangun, 2004 in (Faridah, 2011) and (Kamsianto, 2024).

Leaf spots by fungi Cercospora psidii

Crystal guava leaves were found to be irregular in shape, red in color and had white spots in the middle, thought to be caused by the fungus *Cercospora psidii*. Meanwhile, according to Semangun 1994 in (Faridah, 2011), the symptoms caused by *Cercospora psidii* rangel fungus initially contained round or irregularly shaped spots, brownish red in color. The spot will dry out and the center will turn white. The spots may coalesce to form irregular white patches surrounded by brownish edges.

Infected fruit is brown starting from the tip near the stalk and irregular in shape. Affected guava fruit will rot. On the part of the fruit that is attacked, fungal fruit bodies with black spores will form. Fruit rot that enters the flesh and seeds causes the fruit to become soft and watery (Safdar, at al, 2015). This disease is caused by the fungus *Botryodiplodia sp.* The pathogen attacks the twigs or bark of guava plants. *Botryodiplodia sp.* can produce enzymes that cause soft rot. The fungus maintains itself as a saprophyte on twigs and dead bark. In humid conditions, the fungus will form many conidia on dead plant parts. Controls that can be carried out to control botryodiplodia rot disease are garden sanitation and reducing garden humidity (Faridah, 2011) and (Kamsianto, 2024)

Discussion of booklet development

The booklet was prepared with the help of theory/library. The preparation of the booklet refers to (Prastowo, 2013), namely: Choose the title of the booklet that will be written according to the purpose. The title of the booklet resulting from this research is: "Booklet of Pests and Diseases of Crystal Guava (*Psidium guajava L.*) Based on YouTube Identification Results in the Crystal Guava Garden of Ngargoyoso Karanganyar" Designing an Outline: Design a book outline that includes pictures of pests or diseases that attack crystal guava, descriptions or symptoms resulting from attacks, and management of pests or diseases. Collecting References: Collect supporting references to compile the booklet. Booklet Writing: Pay attention to the use of writing in compiling booklets. Booklet Evaluation: Evaluate the results of the writing by re-reading the suitability of the booklet which was prepared as a guide/enrichment for crystal guava farming. Booklet Making: Make a booklet on pests and diseases of crystal guava. Upload to YouTube: Upload the booklet in video form to YouTube. and the video has been uploaded to YouTube with the following link (https://www.youtube.com/watch?v=LS0TtQ9FjqM)

Fiture 2. several booklet pages (personal documents)

With the results of this research on the preparation of booklets and YouTube videos about pests and diseases of crystal guava in Ngargoyoso Karanganyar, it is hoped that this can become an effective and applicable agricultural educational innovation. This approach is expected to be able to provide appropriate solutions for farmers in dealing with pest and disease problems, as well as increasing the production and quality of crystal guava in a sustainable manner.

Currently, young farmers with high levels of digital learning tend to demand that all extension workers are able to provide digital extension services. Both the characteristics of extension workers are strong and weak but are required to be able to provide digital extension (Kustiari1 dan , Budiman, 2023) therefore agricultural extension workers are expected to always develop their competence in the field of internet/social media applications, especially YouTube because from the results of research (Suratini, 2021) on the use of social media to support agricultural extension activities, it was concluded that the use of social media by agricultural extension workers is in the high category, namely the use of Facebook and WhatsApp social media, the use of YouTube and Instagram social media is in the moderate category.

With the results of this study, it is hoped that it can be used as a basis for developing YouTube media as a means of agricultural extension. Currently, young farmers with high levels of digital learning tend to demand that all extension workers are able to provide digital extension services. Both the characteristics of extension workers are strong and weak but are required to be able to provide digital extension (Kustiari1 dan , Budiman, 2023), agricultural extension workers are expected to always develop their competence in the field of internet/social media applications, especially YouTube, because from the results of research (Suratini, 2021) on the use of social media to support agricultural extension activities, it was concluded that the use of social media by agricultural extension workers is in the high category, namely the use of Facebook and WhatsApp social media, the use of YouTube and Instagram social media is in the moderate category. The results of (Eksanika, Dan Riyanto,, 2017) study on 38 extension workers in the Bogor area showed that the frequency of agricultural extension workers using the internet is still relatively low, and the duration of using the internet is also still relatively low, meaning that agricultural extension workers still carry out their duties by face-to-face with farmers.

The results of this study are expected to be used as a basis for developing YouTube media as a means of agricultural extension. Internet-based extension media (YouTube) can be used inside or outside meetings, replacing indoor extension, but if the two are combined, extension will be more effective and flexible. (Surya, 2 Juli 2019). Everyone can watch the material through uploaded videos. The dissemination of information becomes wider and faster. The extension materials are also more varied and in line with technological advances. Apart from increasing understanding, it can also increase learning accessibility. This media also encourages independent learning. (Meidina, at al, 2024) and (Pratama, at al, 2025).

Conclusion

From the research results, five pests of crystal guava can be identified: fruit fly (Bactrocera dorsalis), ladybug (Epilachna admirabilis), leaf caterpillar (Lepidoptera: Pyralidae), armyworm (Spodoptera litura), and mealybug (Paracoccus marginatus). The diseases identified are: Capnodium citri fungus (sooty mold), anthracnose disease (Colletotricum sp), red rust disease (Chephaleuros virescens), white mold Fusarium sp, fruit rot disease (Botryodiplodia sp), and leaf spot disease (Cercospora psidii). Crystal guava care is carried out by maintaining garden cleanliness, adjusting plant spacing, fertilizing, spraying insecticides, installing fly traps, and wrapping young fruit. The results of this research can be developed into an online booklet in the form of a video uploaded to YouTube with the following link (https://www.youtube.com/watch?v=LS0TtQ9FjqM) as a guide for crystal guava farmers. To obtain optimal results, further research is still needed by paying attention to observation hours in the field, considering that the activity time of insects or plant pests is influenced by environmental conditions.

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Author Contribution
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