J. Product. & Dev.,30(2):145- 173(2025)

Implementing An Integrated Control Program To Control Powdery Mildew And Decreased Associated Plant Diseases Of Grapes In Egypt

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ABSTRACT

Powdery mildew, caused by *Uncinula necator L.* fungus, is one of the most important plant diseases that affect the grape crop and leads to a huge loss in the crop. Therefore, the main goal of the research was to design an integrated control program to combat the disease in addition to combating the rest of the plant diseases that appear on grapes, such as downy mildew, gray mold, and flower blight. The program was designed over 3 seasons (2022- 2024). In the first seasons,(2022), three chemical fungicides control programs (Proposed chemical control program, Mango modified chemical control program and Original chemical control program compared with general control which was untreated, all chemical control programs were depended on different chemical groups were evaluated, including preventive, curative, and systemic. The most effective and efficient chemical fungicides program in decreasing the disease, was proposed chemical, control program, which gave high efficiency in combating the powdery mildew (15, 18 and 21%) Powdery mildew disease severity% , and associated diseases as the percentage of disease incidence at the end of the season reached(11,16% and 19%) fruit rot disease incidence %, (in

Flame, Superior and Thompson ,respectively ,followed by Mango Modified chemical control which decreasing either Powdery mildew disease severity (21, 28 and 33%) or associated diseases incidence % (13 , 18 and 20%) in Flame ,Superior and Thompson ,respectively, comparison with general control which gave (33,39 and 30%). Also,the proposed fungicides chemical control was reduced isolation frequency % of causal fruit rots Pathogens ,under specific farm condition ,comparison with control treatment. In the second and third seasons (2023 and 2024). Also, three integrated control program were been tested to companied between agricultural fertilizers and fungicide alternatives and in comparison with the control treatment. It was proven that the best results were obtained in the Proposed integrated control program, which covered 0% disease severity of powdery mildew, in addition to the fact that the percentage of other diseases at the end of the training 0.0 % followed by Mango modified integrated control program which covered (2.2 and 4%) disease severity of powdery mildew , in addition , 1% Fruit rot disease incidence compared to the control, which were (74 , 74 and 80 %) powdery mildew disease severity % and also 35% Botrytis fruit rot disease induce % in (Film , Superior and Thomason) grapes respectively.

Conclusively, the main objective of the research is to design an integrated control program to combat the powdery mildew of grape disease in addition to combating other associated diseases that appear on grapes, such as downy mildew, gray rot, and flower blight. Three integrated control programs were tested in the dormant stage to compare agricultural fertilizers and fungicide alternatives and compared with the control treatment. It was proven that the best results were obtained in the proposed integrated control program, which covered 0% of the severity of powdery mildew disease, in addition to the percentage of other diseases at the end of the experiment being 0.0%.

Key words: Powdery mildew, grapes, Chemical control programs , Integrated control programs, fruit rot and fertilizers**.**

INTRODUCTION

Powdery mildew is a common disease on many plants. Several powdery mildew fungi cause similar diseases on different plants; *Uncinula necator* on grapevines. Powdery mildew fungi generally require moist conditions to release overwintering spores and for those spores to germinate and infect a plant (Calonnec *et al*., 2004). Powdery mildews normally do well in warm, Mediterranean-type climates, (Carroll and. Wilcox, 2003). The disease can be serious on woody plants such as grapevines, cane berries, and fruit trees

where it attacks new growth including buds, shoots, and flowers as well as leaves. New growth is dwarfed, distorted, and covered with a white, powdery growth.. Grapes with a severe infection may also crack or split and fail to grow and expand. (Gubler and Hirschfelt, 1992). Fungicides Sprays should begin immediately prior to bloom,(Mueen Uddin *et al*., 2023). Early control of primary infections, especially on susceptible cultivars, is important to managing this disease (Gessler *et al*., 2011; Gadoury *et al*., 2012).. If primary infections can be controlled until all the ascospores have been discharged, the amount of inoculum available for causing late-season (secondary) infections is greatly reduced. Failure to adequately control powdery mildew early in the growing season can also result in increased levels of other fruit rots, such as Botrytis bunch rot and sour rot. Effective fungicides include Flint, Pristine, Procure, Sovran, and Sulfur (Mondalet. *et.al.,* 1989). Follow label directions and be sure to alternate fungicides with different modes of action over the course of the season. Producers with susceptible cultivars should plan for a full-season fungicide program to control powdery mildew (John and Julie, 2008). The main goal of this research is to design an integrated control program that contains preventive fungicides alternately with systemic fungicides, and to introduce alternatives to fungicides and fertilizers spraying, (plus the effect of other culture treatments), to reduce fungicide spraying and break the resistance characteristic of fungi (Ram Reddy *et al.,*2017), as well as combating other diseases with the same program, such as gray mold blight, and downy mildew. Kalliopi *et al*., 2020)

MATERIALS AND METHODS

Chemical control field experimental:-

An integrated control program was evaluated on the severity of powdery mildew disease on bunches and shoots of grape trees (*Vitis vinifera* L.) on 3 year in the Nubaria area (Behara Governorate) with sandy soil and drip irrigation through (Flame Superior and Thomson varieties), Vines are grown in the distance between rows was 2 and 3 m within rows, the experiment was arranged in a complete randomized block design with four replicates per treatment, four vines for each one. The first seasons,(2021/ 2022), began with the beginning of spraying the three Programs of chemical program (chemical control Proposed programs (PCP), mango modified chemical 1 program(MPc1 and Farm chemical program (Fcp) compared with general control which was been un tread and was been sprayed with water only . Three successive sprays, as once every week, the fungicides were been

done (Table 1, 2 & 3) mentioned in The schedule starts from 1 / Jan. until May 2nd . Where followed up the associated diseases Powdery mildew. The focus was on tracking the diseases associated with powdery mildew and how to reduce the disease for both of them. In preparation for the start of the integrated control program in the following two seasons. Also to test of the three programs is best in chemical control at each stage of plant growth and the diseases associated with each stage.

The final results was been recorded at season (2022), as disease incidence and isolation frequency % for associated diseases. While the results of Powdery mildew was been recorded as percentage of disease severity % at the end of second season.

An integrated control program field experiment:

Three integrated control program programs (proposed Integrated control) (ICP), Modified Mango Integrated control program (MIP),and original farm integrated control (OFP).

The experiment was carried out during 2023-2024. The chemical spray program was done by spraying fungicides weekly. The fungicides mentioned in the schedule start from 1st Nov. until 2nd May. Also, effect of , fertilizers on the severity of powdery mildew disease were evaluated during two seasons on bunches and shoots. Various fungicides from different chemical groups, including systemic and preventive, were tested. The integrated control program (ICP) proposed was evaluated with recommended agriculture practice, fertilizers and fungicides in (ICP) were compared to the original farm program (OFP), as well as, the modified program for grape(Mango tree program) (MTP) in order to find out which program is more efficient in controlling powdery mildew in grapes, as well as controlling other diseases associated with it, such as blight , and downy mildew.

In this respect, All programs under this study started at first of November dormancy during (dormancy stage) and continuous during winter survives. The programs were used as following:

Stage of grapes growth , Treatments, Date of application, and Date of recorded data of three Integrated control programs (ICP), as well as, Farm original program (Fop), mango modified 1 program(MP1).General control treatment program(Table 4).

That was been done at the same time as previous programs and under the condition, but that was sprayed with only water.

Although the protective fungicides, fertilizers, systemic fungicides and other culture treatment applied from 1 Nov through dormancy and first stage of

Table (1) ; Trade name , rate/100 L ,active ingredient of fungicides and mode of their actions .

Fungicides commercial Name	Dose	Mode Of Action	Active ingredient
Sulfur 80%	250g	All fungal species were highly sensitive to SO_2. Spore germination (Richard and Jane, 2004)	Sulfur(contact) (original source Farm)
Copper sulfate 85%	200g	Effect on fraction of protein and enzymes that due to damage cell wall membrane (Milkovic et al. 2015).after which toxic copper ions are taken up by the germinating fungal spores.ANJALI,et.al, (2021).	Copper sulfate (contact) (original source Farm)
Copper Oxychloride 675 WP	200g		75%copper (contact) (original source Farm
Champion 77%Wp	180g		77%copper hydroxide(protective) (original source Farm)
Vaxarde 50%Sc	20cm	it affected all stages of fungal growth and development. (Wu et al. (2002)	Mancozeb (contact) (original source Farm)
Flint 50% WG	20 g	trifloxystrobin resulted in increased plant growth and leaf chlorophyll content. (Seong Hee Han, et.al.2012). Both pyraclostrobin and trifloxystrobin were highly active causing complete inhibition of spore germination.	50% Trifloxystrobin(protective) (original source Oppa Company)
Topas 10%	10 cm	It belongs to the class of sterol demethylation inhibitors (DMI inhibitors), which inhibits the biosynthesis of cell membrane ergosterol. is a systemic fungicide with protective and curative action.(The first draft was prepared by Professor Mi-Seung Lee, Gyeongsang National University, Republic of Korea)	Penconazole (protective, systemic and curative) (original source Farm)
Tebu 2.25 %Ec	15cm/	Penconazole 3.6 EC Fungicide is in the Group 3 class fungicides. The mode of action of Penconazole 3.6 EC Fungicide is as a demethylation inhibitor of sterol biosynthesis (DMI) which disrupts membrane synthesis by blocking demethylation. Fungal pathogens can develop resistance to products with the same mode of action when used repeatedly. Because resistance development cannot be predicted.(Published by UNITED STATES ENVIRONMENTAL PROTECTION AGENCY WASHINGTON, DC 20460)	Tebuconazol (systemic) (original source Farm)
Delta Dom 25% Ec	50 cm	Many researchers believe that the main reason for the decrease in the effectiveness of preparations that inhibit ergosterol synthesis is repeated u, which led to a decrease in the sensitivity of the phytopathogen. (Lyudmila Grishechkina, et., al., 2021)	Difenoconazole(systemic) (original source Oppa Company)
Score25%EC	50 cm		Difenoconazole(systemic) (original source Oppa Company)
Zoxiazole 50%Sc	50 cm		Difenoconazol15%+Zoxiconazol%(systomic)(original source Farm)
Top Linc52.5 %Sc	75 cm	The mode of action of the strobilurins against fungi is their ability of inhibit mitochondrial respiration by binding Quinol Ox sits of cytochrome b. located in cytochrome bc1complex and that part of the inner of mitochondrial membrane of fungi. This inhibition blocks the electrons transfer between cytochrome b and cyto-chrome c1 that causes disruption of the fungus energy cycle, within halting the production of ATP (Bartlett et. al., 2002).	Azoxystrobin 20%Difenconazol 12.5% (systomic) (original source Oppa Company)
Amistar Top 52.5%SC	75cm		Azoxystrobin(systomic difenconazole(systomic) (original source Oppa Company)
Amistar 25%Sc	50cm		Azoxystrobin(systomic) (original source Farm)
Trolls 25%EW	50 cm	The active ingredient in tebuconazole 3.6 Ag Fungicide is a member of the DMI (Demethylation Inhibitor) fungicide group and FRAC grouping 3. Its mode of action inhibits synthesis of sterols. The triazole fungicide's actions are protective, curative (when applied early the fungal pathogen's life cycle) and systemic in nature. The active ingredient is absorbed by root and leaf tissue, and then moves to the growing tissue. Chlorothalonil is a Substituted Benzene fungicide that slows sporulation and growth rates of fungi and a member of FRAC group Y, Multi Site Action. Its action is protective and makes it a good resistance management partner).	Tebuconazole(systomic) (original source Oppa Company)
Systhane 24%Ec	22cm	Myclobutanil appears to be a specific inhibitor of sterol14-demethylase, which disrupts the ergosterol biosynthesis pathway which is vital to fungal cell wall formation. It is classified as a demethylation inhibitor (DMI) fungicide.	Myclobutanil(systomic) (original source Oppa Company)
Bella 38%Wp	50g	a new fungicide having protective and curative action. It inhibits spore germination, germ tube elongation, mycelial growth and sporulation. FILAN FUNGICIDE acts systemically. For resistance management boscalid is a member of the carboxin group of fungicides. It is a Group G Fungicide.	Boscalid25.2%+pyraclostrobin 12.8%(systomic) (original source Farm)
Canvas 50% Wg	100g		Boscalid(systomic) (original source Oppa Company)
Collise30%Sc	50 cm	Kresoxim-methyl It is a broad spectrum Strobilurin fungicide with a protective, curative and eradicative mode of action. In addition to the spectrum of control it gives good residual activity and hence extended duration of control. It acts by inhibiting spore germination, redistribution via xylem phase contributes to activity. Kresoxim Methyl is very effective against powdery mildew for most of the crops and has good greening effect.	Boscalid30%+kresoximmethyl10%(systomic) (original source Oppa Company)
Hosip 70%Wp	63g	Most effective disease control is obtained by preventative spray timing as climatic conditions indicate fungal infection or growth is imminent.	Thiophanate methyl(systomic) (original source Farm)
Dowok 10%EC	40cm	Tebuconazole inhibits the metabolic pathway of fungi ergosterol production this causes the cell membrane to malfunction, leading to the death of the fungus.	tebuconazole(systomic) (original source Farm)
Vectra10%Sc	40 cm	Bromuconazole is a member of the class of dioxolanes carrying 1,2,4-triazol-ylmethyl and 2,4-dichlorophenyl substituents at position 2 as well as a bromo substituent at position 4. A foliar applied conazole fungicide for a range of crops including cereals, fruit, vegetables and vines. It has a role as an EC 1.14.13.70 (sterol 14alpha-demethylase) inhibitor and an antifungal agrochemical. It is a dichlorobenzene, an organobromine compound, a member of dioxolanes, a member of triazoles, a conazole fungicide and a triazole fungicide.	Bromuconazol(systomic) (original source Farm)
Kocide 75%Wp	200g	Mancozeb is a dithiocarbamate fungicide with effects on the nervous system via its main metabolite, carbon disulfide. Metalaxyl - Fungicide with protective action. Nonspecific (bp) enzyme inhibitor. Metalaxyl - Systemic fungicide with protective and curative action. Absorbed through the leaves, stem and shoot. Inhibits protein synthesis in fungi by interfering with the synthesis of ribosomal RNA.	Mancozeb+ Metalaxyl(systomic) (original source Oppa Company)

Table(2): Fertilizers treatments names , rate, and their mode of action :

TREATMENTS	Rate	Mode of action
Micronics sulfur **(original source Farm)**	250 g/100L	Sulfur is a component of amino acids, proteins, and enzymes. It is also essential for the synthesis of chlorophyll.
Chitosan **(original source Farm)**	0.5 g / litter	conveyed by the positively charged NH_3^+ groups of glucosamine, might be a fundamental factor contributing to its interaction with the negatively charged microbial cell surface, ultimately resulting in impairment of vital bacterial activities
Calcium Phosphate **(original source ,El Gomhoria Com.)**	1.5gm/ L	It reacts with acid in the stomach to raise the pH 3. In toothpaste it provides a source of calcium and phosphate ions to support remineralization of the teeth 1. As a supplement it provides a source of calcium and phospate, both of which are important ions in bone homeostasis.Also, Calcium (Ca) Function : – Aids in the movement of carbohydrates in plants – Essential to healthy cell walls & root structure
Potassium monophosphate **(original source ,El Gomhoria Com.)**	1 gm./L	Monopotassium phosphate, MKP, (also potassium dihydrogenphosphate, KDP, or monobasic potassium phosphate), KH_2PO_4, is a soluble salt of potassium and the dihydrogen phosphate ion. It is a source of phosphorus and potassium as well as a buffering agent. It can be used in fertilizer mixtures to reduce escape of ammonia by keeping pH low.
Potassium di phosphate **(original source ,El Gomhoria Com.)**	1gm/L	Potassium dihydrogen phosphate is a potassium salt in which dihydrogen phosphate(1-) is the counterion. It has a role as a fertilizer. It is a potassium salt and an inorganic phosphate. The active ingredient, potassium dihydrogen phosphate (also referred to as monopotassium phosphate) is a synthesized active ingredient (a.i.). The end-use product is a crystalline powder containing 100% active ingredient. The chemical abstract service (CAS) number for monopotassium phosphate (KH_2PO_4).Also, Potassium (K) Function : – Improves plant ability to resist disease & Cold. – Aids in the production of carbohydrates.
Potassium phosphate **(original source Farm)** **GROUP 33 FUNGICIDE, (Protection), and systemic**	1 ml	Creates an immune response within the host plant and also has direct antifungal activity. (MKP) and (DKP), successively. Spore germination and germ tube elongation inhibition ranged from 0 to 100% for both compounds; in addition, DKP at 2% inhibited mycelial growth completely. Also, Phosphorus (P) Function : – Stimulates early growth and root formation. – Hastens maturity. – Promotes seed production. – Makes plants hardy.
Micro elements **(original source Farm)**	0.1 grn/L	Copper is involved in nitrogen and carbohydrates metabolism. It is a component of several enzymes, including enzymes that take part in photosynthesis and respiration. Iron is Involved in plays an important role in chlorophyll formation. It is involved in cell division that supports plant growth, and in other vital reactions in the plant.Manganese (Mn) is required for photosynthesis and respiration. It improves green color and increases sugar and protein content. Manganese enhances plant tolerance to high light intensity. Boron is necessary for cell wall formation, membrane integrity and calcium uptake. It assists in the translocation of sugars and affects numerous functions in plants, including flowering, pollen germination, fruiting, cell division, water relationships and the transport of hormones.Zinc is a component or functional cofactor in many enzymes, including auxins (plant growth hormones). It is essential for carbohydrate metabolism, protein synthesis and internodal elongation (stem growth).Molybdenum is involved in many enzymes and is closely linked with nitrogen metabolism as it is an important component of nitrate-reductase and nitrogenase enzymes.

Table (3): Stage of application, and Date of recorded data of three chemical control programs (CP), as well as, Farm chemical program (Fcp), mango modified chemical 1 program(MPc1 .

Stage	Date of application	Chemical control Proposed programs (PCP)	Mango modified chemical 1 program(MPc1 .	Farmchemical program (Fcp)
Started, (bud break)	1/1: 11/Jan	Tops	Micronics Sulpher	Micronics Sulpher
Budding, (Budburst) to leave development and Shoot Growth	11/22jan	Micronics Sulpher	Champion	Copper Oxichloride87% WP
	22/Jan / 2/Feb.	Champion	Vevando 50%Sc	Micronics Sulpher
	3/Feb : 13/Feb	Score25%EC	Hesta	Copper sulphate85%
from budding to flowering (Flower Cluster Initiation)	13/Feb : 24/Feb	Copper sulfate 85%	Vectra10%Sc	Topas
	24/Feb: 6/ Mar.	Cantus	Delta Dom	Topas
	7/Mar. : 17/Mar	Telio Z 25 %Ec	Top Line32.5 %Sc	Prodizole
	18/Mar: 28/Mar.	Mycobytil	Systhane	Prodizole
Flower and fruiting set to the growth of clusters	29/Mar.:8/Apr.	Collise30%Sc	Bellise	Bellise
	9/Apr.: 19/Apr.	Amistar- Top	Amisto	Bellise
From the beginning (Fruit Set) Up to Berry Growth (of ripening to full ripening).	20/Apr.: 30/Apr.	Romel	Trolls 25%EW	Domark 10%EC
from (full ripening to Harvest) (Berry Growth Up to Harvest)	1/May: 11/May	Hesta	Filent	Topsen M70%
Stop until harvest				

Table (4): Stage of grapes growth, Treatments, Date of application, and Date of recorded data of three **Integrated control programs (ICP)**, as well as, Farm original program (Fop), mango modified 1 **program(MP1).**

Stage of grape growth	Date Of Application And Date of recorded results	Farm original program (Fop)		Mango Modified program 1(MP1):		The integrated control program (ICP)	
		fungicides	Fertilizers	fungicides	Fertilizers	fungicides	Fertilizers
Dormancy winter service	1/Nov.Up tol 1/Nov.	(copper sulfate) Frist spryer	00	Copper oxychlorid) Frist spryer	00	(Micronics sulfur) Frist spryer	00
	12/Nov. up to 21/Nov.	(copper sulfate) Second spryer	00	copper oxychlorid) Second spryer	00	(champion) Copper hydroxide	00
	22/Nov.Up to 2/Des.	00	(chitosan)	(Micronics sulfur) Frist spryer	00	00	**potassium mono-phosphate**)
	3/Des. Up to 13/Des	(Micronics sulfur) Frist spryer	00	(Micronics sulfur) Second spryer	00	00	(chitosan)
	14/Dec. up to 24/Des.	(Micronics sulfur) Second spryer	00	00	(potassium phosphate)	(Micronics sulfur) Second spryer	00
Started irrigation Followed that Started bud break	**25/Des. Up to 4/Jan**	00	potassium phosphate	(Topas) Frist spryer	00	**(Teliozol)**	00
Budburst, bud break and Shoot Growth	**5/Jan up to 15/Jan**	(score) Frist spryer	00	(Topas) Second spryer	00	(Hesta)	00
	16/Jan Up to 26/Jan	(score) (difenoconazol) Second spryer	00	00	(potassium phosphate)	00	(chitosan)
Shoot Growth Up to leave development, (stage 11)	**27/Jan Up to 7/Feb.**	(Topas) Frist spryer	00	(amesto) Frist spryer	00	(Tetraconazol)	00
Shoot Growth Up to Stage19	**8/Feb.Up to 18/ Feb**	(Topas) Second spryer	00	(Systhane)	00	(Domark)	00
Shoot Growth Up to Flower Cluster Initiation	**18/Feb. Up to 1/Mar.**	00	(poasium monophosphate)	00	(chitosan)	00	(potassium phosphate))
Flower Cluster Initiation	**1/Mar. Up to 11/Mar.**	(Amistar top) Frist spryer	00	(Score)	00	Topline	00
Flower Cluster Initiation Up to Flower	11/Mar. up to 21/Mar	(azoxystrobin+ difenoconazol) (Amistar top) Second spryer	00	(azoxystrobin) (Amisto) Second spryer	00	(mancozeb+ metalaxyl)	00
Flowering and Fruit Set	**22/Mar Up to2/Apr.**	(mancozeb+metalaxyl	00	(Amistar - top)	00	(Bellis)	00
	3/Apr.Up to 13/Apr.	00	(potassium di phosphate)	(Bellis)	00	(Hotshot)	00
Fruit Set Up to Berry Growth	14/ April up to 24/Apr.	(Thiophenate methyl) Topsen _M70% Frist spryer	00	00	(chitosan)	00	(potassiu mono phosphate)
Berry Growth Up to Harvest	25/Apr. Up to 2/May	Thiophenate methyl) Topsen _M70% Second spryer	00	(felent)	00	(Vevando)	00
Stop until harvest							

grape growth , until 27/Jan, But the rustles showed first disease symptoms appeared either original farm program or general control.

Disease severity:

Scale 1*:* determination of oidium and mildew diseases of grape heads on vine bushes Scores (Asror Rakhmatov *et al*., 2023)

0 – no damage;
0:1- some fruits on grape heads are damaged;
1-Fruits on 1st grape heads are damaged up to 5%;
2- 5% to 10% of fruit on 2-vine heads are affected;
3- 10% to 25% of fruits on 3-vine heads are damaged;
4- More than 25 percent of the fruits on the grape heads are damaged.

Scale 2: detection of oidium and mildew diseases on green branches of vine bushes Scores:

0 - no damage;
0:1- rare, barely noticeable spots on branches;
1- Branches are damaged up to 10%;
2- Branches are damaged up to 25%;
3- Branches are damaged up to 50%;
4- More than 50 percent of branches are damaged;

The following formula is used to determine the incidence rate

[1]: $X = (\times 100 \div b)$ %

Where: X is the incidence rate, a – the number of identified diseased plants, and b – total number of plants counted.

The level of plant disease severity is determined using the following formula [3]:

$Uk = E \times (a \times b) \div B \times C$ %

where: Uk – incidence rate, %; $E \times (a \times b)$ – sum of the number of diseased plant members (leaf, stem, fruit) in each variant multiplied by (a) their characteristic score (b); B - the number of plant parts (leaf, stem, fruit) taken for control; and, C- the highest morbidity score received in the experiment..

Also, Mueen Uddin *et al*., (2023), The disease severity was assessed using 0-4 scale,

Where:- .

0=no diseases present, 1=15-25% leaf area and berries infected, 2=26-50% leaf area and berries infested, 3=51-75% leaf area and berries infected, 4=more than 75% leaf area and berries infected):

$$DS\ \% = \sum (AXB) / M \times B_{max} \times 100$$

Where : A – the number of diseased leaves from all the levels; B – the level of each diseased leaf; M – the total number of the leaves; Bmax – the highest level of the disease.

On the other diseases were recorded to as disease incidence % (as general notes recorded) as the following formulae :-

PDI%= sum of infected plants ÷ total number of plants observed× 100

In this point, the main objective was if the powdery mildew fungicides could decrease the other associated disease symptoms

Associated diseases:

The most associated serious diseases under grape farm experimental were been Botrytis blight and downy mildew.

1-**Botrytis blight**:-

Botrytis cinerea Pers.:Fr(anamorph *of Botryotinia fuckeliana* (de Bary) Whetzel) is the causal agent of gray mold, an important disease that affects grapevine (*Vitis vinifera* L.*)* and causes significant yield and quality losses worldwide ,Elmer and Michailides, (2007). *B. cinerea* develops as a saprophyte, necrotroph, or parasite on multiple grape organs including leaves, green shoots, rachides, flowers, bunch trash (such as calyptras, dead stamens, aborted flowers and berries, and tendrils), and ripening berries. *B. cinerea* also has multiple infection pathways, and infections mainly occur from flowering to fruit set and after version (Valeria Altie *et al*., 2023).

The main studies were carried out during the growing season. The vegetation period is divided into 6 phases:

#1 - until buds are written from the movement of aphids;

Phase #2 - from budding to flowering;

Phase #3 - from flowering to fruiting;

Phase #4 - the growth of clusters - from the formation of clusters to ripening;

Phase #5 - ripening of gujums - from the beginning of ripening to full ripening. According to Rakhmatov *et al*.(2024).

During spring flowers can become infected through the stigma and through a scar on the tip of pedicel. The fungus then begin to dormant and waiting for late in the season when the sugar concentration increases in the infected berry, Aqleem Abbas (2017). Inoculation of flowering inflorescences of field-grown Gamey grapevines with *B. cinerea* conidia increased latent infection in young berries and disease expression in ripe berries compared with naturally infected controls. Although latent *B. cinerea* mostly was restricted to the receptacle area in young berries, the

fungus also invaded the rest of the berry during ripening.(Markus Keller, *et al*., 2003).

Sampled vine stocks, one reproductive organ, *i.e.*, an inflorescence becoming a bunch, was monitored at three critical development phases, *i.e.*, flowering, version, and harvest. By using the Eichhorn and Lorenz 1–47 scale, modified by Coombe (1995), these main phonological stages corresponded to flowering ("full bloom," 50% caps off, code 23), version (berries begin to color and enlarge, code 35), and harvest (berries harvest-ripe, code 38).

Successful implementation of bio suppressive methods for control of *B. cinerea* is dependent upon an intimate knowledge of the ecology and epidemiology of the disease in vineyards (Elmer & Michailides, 2004; Holz et al., 2004 and Elmer and Reglinski, 2006). *Botrytis cinerea* infects leaves, buds, canes, and bunches of grape (*Vitis vinifera* L.) and causes gray mold (Nair and Hill1992).

Botrytis blight diseases were recorded to as disease incidence % according **to (Mamiev *et al.*,2020)**
as the following formulae :-
PDI%= sum of infected plants ÷ total number of plants observed× 100

2- Downy mildew

Rating levels for infection of leaves downy mildew under field condition: Rating of level infection according to (Atak, 2017):
Level Symptom:

1- Very low (tiny necrotic spots or no symptoms; neither sporulation nor mycelium).
3- Low (small patches < 1 cm in diameter; little sporulation or mycelium).
5- Medium (little patches 1 to 2 cm in diameter; more or less strong sporulation; irregular formation of mycelium).
7- High (vast patches; strong sporulation and abundant mycelium; leaf drop later than below).
9- Very high (vast patches or totally attached leaf blades; strong sporulation and dense mycelium; very early leaf Drop.

In this respected effect of three powdery mildew control programs that studied their effect to decreasing disease severity% of downy mildew under the same condition.

$$DS\ \% = \sum (AXB) / M \times B_{max} \times 100$$

Where : A – the number of diseased leaves from all the levels; B – the level of each diseased leaf; M – the total number of the leaves; Bmax – the highest level of the disease.

Statistical analysis

This experiment was arranged as a complete randomized block design with four replicates, three vines per each one. according to Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Data in Table (5) showed spraying was done at the beginning of Jan., and the spraying was repeated every week for three successive sprays until 2 of May. The fungicides and their effect on ever stage were evaluated. Generally, the results showed significant differences between all three chemical programs and the general control treatment which was been untreated. There are also significant differences between the varieties; the most susceptible variety to the disease was the Thomson grape variety, while the Superior and Flame varieties were close to each other in susceptibility to the disease. The proposed chemical control was the most effective followed by Mango chemical control program Modified in decreasing the all diseases, either powdery mildew or other associated diseases, after them original farm chemical control program. Also, general, Film verity was more tolerant than superior, while Thomson verity was more susceptible.

Data showed at Started bud break stage Powdery mildew did not show visible symptoms. On the other hand, associated disease gave the dead buds diseases or di- back symptoms.

In this respected, The proposed chemical control program gave most disease incidences % (3, 4 and 6) of di back or dead new buds on the three varieties respectively. While, Mango modified control program gave 4, 7 and 9% di –back or dead new buds on the three grapes variety respectively. On the other hand , original farm program which gave 5,11 and 14 % di-back disease incidence on the same three varieties, respectively, compared with Control treatment which gave (9,11and 18 %) di – back or dead new buds disease incidence on (Film, superior and Thomsen) grape varieties respectively. At the end of experimental first season, The proposed chemical control pregame was been recorded the lest results either on associated disease (11,16 and 19 % fruit rot dis ease incidence % or disease severity% of powdery mildew (15,18 and 21 %) infected fruit by powdery mildew compared with control treatment which gave (33, 38 and 40%) fruit rot disease incidence and (36,40 and 48%) infected fruit powdery mildew diseases severity on the three grape variety respectively (Table 5).

Table (5): Effect of three Proposed chemical control programs (PCP), as well as, Farm chemical program (Fcp), mango modified chemical 1 program(MPc1) on diseases severity of Powdery mildew , and also. disease incidence % some foliar three grape varieties (Film ,Superior and Thomson) diseases(Di- back ,leave spotsm follower blight and fruit rot),under Noubria region condition , season(2022).

Stage And diseases	Proposed chemical control programs (CP)			mango modified chemical 1 program(MPc1			Farm chemical program (Fcp			chemical control programs (CP)			mango modified chemical 1 program(MPc1			Farm chemical program (Fcp		
	Disease incidence % 2022 Associated Diseases									Disease Severity of Powdery Mildew % 2022								
	Film	Superi or	Thoms on	Film	Superi or	Thoms on	Film	Superio r	Thoms on	Film	Superi or	Thoms on	Film	Superi or	Thoms on	Film	Superi or	Thomso n
Diseases	Di- back									Di- back								
Started bud break (0.0 Time)	3	4	6	4	7	9	5	11	14	00	00	00	00	00	00	00	00	00
General Control	9	11	18	9	11	18	9	11	18	00	00	00	00	00	00	00	00	00
Diseases	Levees spots									Levees spots								
Budding (Budburst) to leave development and Shoot Growth	12	19	16	9	14	20	16	22	29	13	8	11	14	10	15	18	17	20
General Control	23	25	30	25	30	35	23	25	30	27	31	36	27	31	36	27	31	36
Diseases	Twig blight									Twig blight								
from budding to flowering (Flower Cluster Initiation)	4	8	11	7	10	17	9	14	19	5	8	11	10	13	22	16	20	28
General Control	18	27	33	23	30	35	18	27	33	36	40	48	36	40	48	36	40	48
Diseases	Flower blight									Flower blight								
Flower and fruiting set to the growth of clusters	3	5	9	5	8	12	8	10	15	5	8	12	9	11	17	11	18	21
General Control	24	31	36	24	31	36	24	31	36	39	45	50	39	45	50	39	45	50
Diseases	Fruit set Blight and unmetered fruit rot									Fruit set Blight and unmetered fruit rot								
from the beginning (Fruit Set) Up to Berry Growth(of ripening to full ripening)	1	4	5	3	6	9	3	7	11	2	5	8	7	9	12	13	19	20
General Control	29	37	38	29	37	38	29	37	38	42	48	53	42	48	53	42	48	53
Diseases	Fruit rot at harvest time									Fruit rot at harvest time								
- from full ripening to Harvest (Berry Growth Up to Harvest)	11	16	19	13	18	20	17	20	25	15	18	21	21	28	33	27	34	40
General Control	33	38	40	33	38	40	33	38	40	45	50	58	45	50	58	45	50	58

In this respect, the grape crop is one of the most important export fruit crops in Egypt to Arab countries and foreign countries as well (Wala Abdel Hadi, 2023). Therefore, it was important to design an integrated control program that includes controlling powdery mildew, (Mueen Uddin *et al*., 2023) found that , in conclusion, a protective fungicide spray before bloom, followed by a systemic fungicide spray at berry formation, effectively controls *U. necator* and ensures healthier and higher grape yields. On the other hand, the diseases associated with it such as downy mildew, gray mold, Alternaria blight, and others,(Anand *et al*., 2010) found that spraying of azoxystrobin at different doses *viz*., 31.25, 62.50 and 125 g *a.i.* ha-1 revealed that 125 g *a.i.* ha-, recorded only 3.90 and 4.86 per cent disease index (PDI) of leaf blight and 0.00 and 2.42 PDI of leaf spot and also recorded the higher yield of 27.60 and 26.30 tones ha-1 in the first and second season, respectively. They also, reported no phytotoxic effect of azoxystrobin was observed in both the field trials of tomato even at four times the recommended doses of 125 g a.i. ha-1. However, the persistence of azoxystrobin at 31.25, 62.50 and 125 g a.i. ha-1 was observed up to three to five days after last spraying.

The goal in this research is to implement a single program for all of these diseases. The main key to an integrated pest control program is timing as well as the type of fungicide [Sônego *et al* 2022] . Many fungicides were tested in the first and second seasons from various chemical groups, whether systemic or non-systemic, and the compounds azoxystrobin, difenoconazole, and tetraconazole proved highly effective in reducing the spread of powdery mildew (Grovem,2000; Deliere, 2010 and Abdelhak Rhouma, *et.,al*., 2021).

Data in Table (6) obtained that, as general, there were differential not only between the grape varieties, but also, between causal pathogens at differential stages. Anyhow, *Alternia* and *Botrytis* followed by *Aspergillus* were the most isolation frequency% at all stages. But , under farm experimental condition, *Botrytis* was more isolation frequency % than *Alternaria* from fruit rot at harvest time .On the other hand , the proposed chemical control program was the most decreased isolation frequency % of all causal pathogens fruit rots, which gave (14, 22 and 30%) *Botrytis cenaria, Alternaia alternate* (4,6 and 8%) and *Aspergillus niger* (2,5 and 6%) on three grape varieties (Film , Superior and Thomson) respectively, compared with general control untreated treated , which recorded (44,50 and 57 %) *Botrytis cenaria* ,(15,19 and 20%) *Alternaria alternate* and (20,25 and 30%) *Aspergillus niger* on the three different grape varieties ,respectively. Also, data in Table 6 showed both of *Phompsis sp* and

Table (6): Effect of three Proposed chemical control programs (PCp), as well as, Farm chemical program (Fcp), mango modified chemical 1 program(MPc1 on isolation % of causal fungal pathogenic three grape varieties (Film ,Superior and Thomson) diseases(Di- back ,leave spots follower blight and fruit rot), under specific grape excremental farm at Noubria region condition , season (2022).

Stage	Associated Diseases	Frequency of isolation %(control Treatment)			Proposed chemical control programs (PCp)			Mango modified chemical 1 program(MPc1			Farm chemical program (Fcp		
		Frequency of isolation 2022%			Frequency of isolation 2022%			Frequency of isolation 2022%			Frequency of isolation 2022		
		Film	Superior	Thomson	Film	Superior	Thomson	Film	Superior	Thomson	Film	Superior	Thomson
Started bud break (0.0 Time)	Di- back Alternaria	18	21	24	7	10	13	10	12	16	14	17	20
	Phomopsis	6	10	16	2	5	9	3	5	10	4	7	12
	Botrytis	12	15	18	5	6	11	7	7	13	9	9	13
	Botrydipodia	5	8	11	2	3	6	2	4	7	3	5	9
	Others (cercospora, fusium, Aspergillus spp and Penicillium)	3	5	5	0	1	3	1	2	4	1	3	3
		2	6	8	1	2	2	1	3	3	1	4	5
		2	2	3	00	00	00	00	00	1	1	1	1
		2	3	4	00	00	00	0	1	2	0	2	3
	Leaves spots												
Budding (Budburst) to leave development and Shoot Growth	Alternaria	12	18	20	4	6	9	7	8	11	9	11	11
	Phomopsis	9	12	16	4	5	8	6	8	9	5	8	10
	Botrytis	16	19	21	5	7	12	6	8	11	10	12	16
	cercospora	5	8	11	1	3	6	2	5	6	4	6	9
	others	13	18	22	4	9	14	8	10	16			
Twig blight													
from budding to flowering (Flower Cluster Initiation)	Alternaria	18	22	25	4	8	10	6	9	13	9	14	17
	Botrytis	21	25	29	5	8	7	8	11	11	9	11	16
	cercospora	1	3	4	0	0	0	0	0	0	0	1	1
	Others(Fusarium	11	15	18	1	3	7	1	3	8	4	7	11
	Penicilium)	0	1	4	0	0	0	0	0	0	0	0	1
	Flower blight												
Flower and fruiting set to the growth of clusters	Alternaria	22	28	30	7	11	15	10	14	18	10	17	21
	Botrytis	13	16	21	4	5	8	4	9	11	7	12	15
	Phomopsis	11	17	24	2	3	5	3	5	10	6	8	16
	Others	16	22	23	2	7	12	5	8	12	7	13	15
	Aspergillus Penicillium	1	2	5	00	00	00	00	00	0	0	1	2
	Cercospora	2	5	6	00	00	0	00	00	0	1	1	3
from the beginning (Fruit Set) Up to Berry Growth(af ripening to full ripening)	Fruit set –fruit rot(Unmetered)												
	Botrytis	6	9	10	1	3	5	1	5	7	3	6	8
	Alternaria	26	30	35	5	9	9	9	12	16	11	16	18
	Phomopsis	2	5	6	00	0	0	00	0	1	0	1	4
	Aspergillus	0	1	2	00	00	00	00	00	00	0	0	0
	Penicillium	0	0	0	00	00	00	00	00	00	00	00	00
	Cercospora	0	0	0	00	00	00	00	00	00	00	00	00
- from full ripening to Harvest (Berry Growth Up to Harvest)	Fruit rot at harvest time												
	Botrytis	44	50	57	14	22	30	19	26	33	25	31	39
	Alternaria	15	19	20	4	6	8	6	9	9	11	13	15
	Phomopsis	1	1	3	0	0	0	0	0	0	00	00	1
	Aspergillus	20	25	30	2	5	6	7	8	11	16	18	22
	Penicillium	1	4	8	00	00	00	00	00	1	00	00	2

Pencillium isolated from fruit rots control treatment (1,1, and 3) and (1,4 and 8%) respectively, while Proposed chemical control program gave(0,0 and 0%) and (0,0 and 0%) *Phompsis* and *Pencillium* , on the three grapes different varieties ,respectively.

On the other hand, Mango chemical control program modified resulted,(19 26 and 33%) *Botrytis cenaria*, (6, 9 and 9) *Alternaria alternate*, (7 ,8 and 11) *Aspergillus niger*, (0,0, and 1%) *Pencillium* sp and (0,0and 0) *Phompsis f*ruit rot causal pathogens frequency isolation%, on the three different grape varieties ,respectively. While, original farm chemical control program recorded (25,31and 39%) *Botrytis cenaria*, (11,13and 15 %) *Alternaria alternata,(*0,0 and 1 %) *Phompsis*, (16 ,18 and 22%) *Aspergillus niger* and (0,0 and 2%) *Pencillum sp* fruit rot casual Pathogens frequency isolations%, on the three different grape varieties, respectively.

In this respect, Ram *et al*. (2017) reported that**,** powdery mildew in grape and also analyzed the terminal fungicidal residues in grape produce. The results revealed that spraying of Fusilazole 40EC (0.125ml/l) at 40 days after forward pruning followed by– Penconazole10EC (0.5ml/l)+ Potassium bicarbonate (g/l)at 60 days AFPR – Triademefon 25WP (1g/l)at 70 days after hexaconazole 50 EC% (1ml/l)+ Potassium bicarbonate (5g/l) at 80 days AFPR – Myclobutanil 10WP(0.4g/l at 90 days AFPR – Azoxystrobin 23SC (0.5ml/l) at 105 &120 days after (or) Fusilazole40 EC (0.125 ml/l) at 40 days after forward pruning followed by Penconazole 10 EC (0.5 ml/l)+ Potassium bicarbonate (5 g/l) at 60 days after forward pruning followed by Triademefon 25WP (1.0 g/l)at 70 days after forward pruning followed by Hexaconazole 5 EC (1.0 ml/l) + Potassium bicarbonate (5 g/l)at 80 days after forward pruning followed by Myclobutanil 10WP (0.4 g/L) at 90 days after forward pruning + Pyraclostrobin 20%WG (0.5g/l)at 105 & 120 days after were found to be significantly on par with each other in reduction of PDI on leaves, berries and enhanced marketable yield per vine (Kg) over other six spray schedules and control.

Also, Mondal *et al.,* (2005) recorded that , The baseline sensitivities for mycelial growth of foliar fungal pathogens of citrus, *Colletotrichum acutatum*, *Alternaria alternata*, *Elsinoe fawcettii*, *Diaporthe citri*, and *Mycosphaerella citri*, the causal agents of postbloom fruit drop, brown spot of tangerine, citrus scab, melanose, and greasy spot, respectively, were determined in vitro for azoxystrobin, pyraclostrobin, and fenbuconazole. The effective dose to reduce growth by 50% (ED50 values) was determined for each pathogen–fungicide combination using five isolates from different citrus areas of Florida and eight fungicide concentrations. A discriminatory

dose for each combination was selected near the ED50, and the range of sensitivity of 50 to 62 isolates of each fungal species was determined. The effect of nsalicyl hydroxamic acid (SHAM) on the sensitivity of the five fungal species to azoxystrobin and pyraclostrobin was determined. Discriminatory doses have been established for these pathogen–fungicide combinations that should be useful for detecting major shifts in fungicide sensitivity**.**

While, Mueen Uddin *et al.* (2022) resulted that Powdery mildew caused by *Uncinula necator* (Schw.) Burr. caused economic losses through poor fruit set and low yield substantially. To decrease the inoculum potential, a disease management program must be undertaken early in the season which is imperative to reduce late-season disease problems. Because, without early control of the infection of powdery mildew, often lead to severe problem in the late season. Elemental sulfur was the foremost antifungal utilized for the control of powdery mildew which is still in use as an effective and cheap fungicide for vineyards. Sterol biosynthesis inhibitors (SI), also called SI fungicides, are the latest products to control powdery mildew effectively. For efficient use of fungicides with no or less resistance to the pathogen, it is appropriate to spray fungicides having different mechanisms of action which are specific in function, and for more efficacy, use a mixture of such fungicides that have no harmful impact on plant growth and environment. So, for effective control of powdery mildew, a protective spray of fungicide before bloom and a subsequent spray of systemic fungicides at the time of berry formation ensure healthy and higher grapes yield.

Data in Table (7), obtained the results of applying the integrated proposed control program in the research, the original farm program, the modified Mango control program and the effect of these three programs on the disease severity of powdery mildew, as well as their effect on associated plant diseases incidence % such as blight, downy mildew, and fruit rot. Fungicides were applied with agricultural fertilizers and fungicide alternatives, and the beginning of spraying was in November during the winter service of the trees on the second and third seasons (2023 and 2024). Spraying was stopped three weeks before harvest.

The results in Table 7 showed the superiority of the proposed integrated control program in comparison with the original program for the farm and Mango modified integrated control program spraying program, as at the end of the spraying the disease rate reached (0,0, and 0%) disease severity of powdery mildew. While, in Mango modified program the disease rate reached (2.2. and 4%) powdery mildew disease severity and the

Table (7) : Effect of three integrated control programs on Powdery mildew of three different varieties grapes diseases severity ,on El- Nuobaria locations, at two successful seasons (2023 and 2024)..

Treatments	Stage of growth	DS% Powdery mildew disease					
		Flame DS%		Superior DS%		Thompsons DS%	
		2rd season	3th season	2rd season	3th season	2rd season	3th season
Proposed program	Dormancy winter service	0	0	0	0	0	0
Modified farm program 1		0	0	0	0	0	0
Farm Program		0	0	0	0	0	0
CONTROL		0	0	0	0	0	0
Proposed program		0	0	0	0	0	0
Modified farm program 1		0	0	0	0	0	0
Farm program		0	0	0	0	0	0
Control		5	1	2	8	6	2
Proposed program	bud break and Shoot growth	0	0	0	0	0	0
Modified farm program 1		0	0	0	0	0	0
Farm program		4	4	4	4	4	4
Control		8	8	8	12	12	12
Proposed program		0	0	0	0	0	0
Modified farm [rogram1		6	6	4	4	4	4
Farm program		6	6	8	6	6	6
Control		12	12	16	20	20	24
Proposed Program	Shoot growth Up to Flower cluster initiation	0	0	0	0	0	0
Modified farm program 1		8	8	10	6	6	8
Farm program		12	12	16	12	8	12
Control		24	28	28	32	32	36
Proposed program	Flower cluster initiation	0	0	0	0	0	0
Modified farm Program		8	6	8	4	4	4
Farm program		8	8	12	4	8	8
Control		40	36	40	44	44	48
Proposed Program	Flower cluster initiation Up to Flower	0	0	0	0	0	0
Modified farm Program 1		4	6	7	3	4	6
Farm program		10	8	7	6	7	5
Control		48	48	52	48	52	56
Proposed program	Flowering and Fruit Set	0	0	0	0	0	0
Modified farm Program 1		6	7	8	7	6	9
Farm program		12	10	9	8	9	7
Control		54	54	58	58	58	64
Proposed program		0	0	0	0	0	0
Modified farm Program 1		8	8	10	6	6	6
Farm program		10	8	10	8	6	6
Control		58	58	64	62	60	66
Proposed program	Berry growth Up to Harvest	0	0	0	0	0	0
Modified Mango Program		4	2	6	2	2	4
Farm program		4	4	6	4	4	4
Control		70	70	70	74	74	80

original program, it was(4,4 and 4%) compared to the control, which reached (74 , 74 and 80%) Powdery mildew diseases severity on the three grapes varieties (Film, Superior and Thomson), respectively.

Alternatives and fertilizers were tested, and the best of them were champion and Chitosan, is one of the nutrients that grapes were treated with, and it has shown a significant reduction in the % severity of powdery mildew disease. It is one of the deacetylated chitin derivatives, as it sends signals to the plant to defend against plant pathogens as well as some viral diseases. It is safe for the plant, as it is considered an environmentally friendly alternative to fungicides, and these are the results compatible with (Iriti *et al*., 2011). Seyed *et al.,* (2021), resulted that the use of a multi-site fungicide in cucumber downy mildew protection programs are recommended to ensure crops are adequately protected and delay a possible resistance development of high-risk groups of single-site fungicides. Commercially available dicopper chloride trihydroxide (also known as copper oxychloride) based fungicides (M FRAC Group) were assessed for their efficacy against cucumber downy mildew.

In addition to chitosan, (Victoria *e.al*., 2023) , resulted that, Chitosan is meant to offer an alternative for the classic treatment with Bordeaux mixture (BM), which represented the control variant ,on grape plants. Among the individual phenols Gallic acid was predominant, with higher values and significant increases determined by chitosan treatment and it increased by 97% as compared to BM treatment

On the other hand, Table 8 showed at the end of experimental spraying field , *Botrytis cenaria* fruit rots diseases incidence% decreased to reach in the proposed program(0,-0 and 0%), Mango modified integrated control was (0,0 and 1 %) disease incidence , original farm program was (9, 10 and 15%) disease incidence on the three gapes verities (Film, Superior and Thomson), respectively, as compared with control treatment (Untreated) which was (35,35,35 %.) *Botrytis cenaria* fruit rots diseases incidence% on the three gapes verities (Film, Superior and Thomson), respectively (Table 8).

On the other hand, calcium and potassium fertilization gave good results in reducing the disease rate that results were mentioned with Tomal and Soska, (2004) that affects of sprays trees with various calcium, phosphorus and calcium-phosphorus preparations depended on the type of preparation. Foliar calcium fertilization increased Ca concentration in apples. A better calcium supply affected the appearance of apples (usually more green background peel coloring, reflected in the chlorophyll content). In storage these fruits ripened later and lost less of their firmness than apples

Table (8): Applying three control programs and their effect on **Botrytis blight disease Incidence %** on three grape varieties during two seasons. (2023and 2024)

Treatments	Stage of grape growth	Botrytis blight disease Incidence %					
		Film		Superior		Thomson	
		2nd season	3th season	2nd season	3th season	2nd season	3th season
Frist symptoms of Btrytis blight appeared on leave at 6/2 as few spots that showed at Modified program1(Mop1) , original farm program(Fp) and general control							
Pp	Frist leave of *Botrytis* blight	0	0	0	0	0	0
Mo p 1		1	0	2	1	1	1
F p	.Shoot Growth	2	1	3	1	3	2
Control		**7**	**10**	**8**	**10**	**10**	**15**
P p	.Shoot Growth	0	0	0	0	0	0
Mo p1	**Up to**	0	0	0	0	0	0
Fp	**Stage19**	0	0	0	0	0	0
Control		**10**	**15**	**10**	**10**	**15**	**20**
Pp (P ph)	Shoot Growth	0	0	0	0	0	0
Mo p 1	Up to	0	0	0	0	0	0
Fp	Flower Cluster Initiation	3	1	5	2	5	3
Control		**12**	**20**	**15**	**18**	**18**	**20**
Pp	**Flower cluster initiation**	2	0	3	0	5	3
Mop 1	**Up to**	5	1	5	2	5	2
Fp	**Flower**	8	6	18	15	20	15
Control		**18**	**26**	**30**	**25**	**28**	**30**
Pp	**Flower blight**	5	1	10	5	8	5
Pp	**Flowering and Fruit set**	3	0	5	1	5	3
Mo p 1		5	1	5	2	8	5
Fp		10	7	15	9	15	10
Control		**19**	**22**	**28**	**23**	**28**	**30**
Pp	**Fruit gray rot**	1	1	3	0	0	0
Mo p1		3	1	5	0	0	1
Fp		10	7	10	9	10	15
Control		**30**	**35**	**35**	**33**	**35**	**35**

from control trees. With the higher calcium content in fruits the share of apples with physiological disorders decreased. The lowest losses of apples related to physiological disorders were observed when trees were sprayed with the solutions of Kalcisal or Rosacal.Also, Amira *et., al.,*(2021) found that the optimum concentrations of salts for inhibiting of growth of *Ulocladium chartarum, Aspergillus niger, Fusarium semitectum,* and its spores. *Geotrichum candidum* were 4, 3, 3, 3% (w/v) for sodium carbonate, sodium bicarbonate, potassium nitrate and calcium chloride.

Data in Table 9 obtained that at the end of stage Flower Cluster Initiation Up to Flower (on leaves) and also after Conducting the process of folding grape leaves treated, Downy mildew diseases incidence% decreased to reach in the proposed program(0,-0 and 0%), Mango modified integrated control was (2,3 and 9 %) disease incidence , original farm program was (3, 4 and 11%) disease incidence on the three gapes verities (Film , Superior and Thomson), respectively, compared with control treatment (Untreated), which was (35,50,and 50 %.) Downy mildew leaves diseases incidence% on the three gapes verities(Film, Superior and Thomson), respectively (Table 9).

However, Jin Wang *et al.,* (2024) reported that Potassium-containing fertilizers affected the expression levels of genes regulating sugar metabolism and potassium ion uptake and transport. However, potassium-containing fertilizers can promote sugar accumulation and reduce acid accumulation in grape fruits, and potassium sulfate and potassium dihydrogen phosphate had the best effects fertilizers. While, Bowen *et.al* 1992 that foliar application of potassium salts reduced Powdery mildew on grape leaves . Reuveni *et. al.* 1997 and Calzarano *et.al.,(* 2014) showed that the foliar application of phosphate salts controlled powdery mildew in cucumber, roses, mango, apple, nectarine, and grapes. and from here it was selection of fungicides and alternatives that will be included in the integrated control program in the fourth and fifth seasons, which gave excellent results by reducing the spread of mildew as well as other diseases in the same program, as the beginning of spraying was the first of January, and it was taken into account to start with sulfur and copper compounds as preventive fungicides, and then after that. Inserting systemic fungicides into spraying (Schäufele and Hamm, 2017).In the fifth and sixth seasons, the integrated control program applied to mangoes was compared with the program proposed in this research and also with the original farm program. The introduction of non-systemic sulfur and copper compounds in exchange with systemic fungicides was taken into consideration to break the resistance to the fungus. Early spraying was done in November with

Table (9): Applying three control programs and their effect on Downy mildew disease severty %on three grape varieties during two seasons. (2023and 2024)

Treatments	Date Of application	Downy mildew disease sverity% On leaves					
		Film		Superior		Thompsons	
		5rd season	6th season	5rd season	6th season	5rd season	6th season
Frist symptoms of Downy mildew appeared on leave at 11/3 as few spots that showed at Modified program1(Mop1) , original farm program(Fp) and general control							
Pp (manco+meta)	**Flower Cluster Initiation Up to Flower**	0	0	0	0	0	0
Mop 1 **(Amis-top)**		3	1	5	2	1	3
Fp **(amis- top)**		5	20	30	3	10	20
CONTROL	**Without treatments**	**20**	**33**	**38**	**20**	**40**	**45**
Pp (be)	22/ Mar: 2/Apr. **Conducting the process of folding grape leaves**	0	0	0	0	0	0
M p 1	**Flowering and Fruit Set**	5	7	10	2	3	9
Fp		5	7	15	3	4	11
CONTROL	**Without treatments**	**30**	**40**	**40**	**35**	**50**	**50**
Pp (Ho)		0	0	0	0	0	0
Mo p 1		0	0	0	0	0	0
Fp		5	6	17	3	15	10
CONTROL	**Without treatments**	**33**	**50**	**50**	**39**	**56**	**60**

preventive fungicides. The proposed program has proven its effectiveness. It is tremendous in control compared to the farm program and the modified program for grape trees was been done in previous study (at Al-Nubaria and Ismailia regions disease control program, and not only for powdery mildew, but also for other grape diseases such as downy mildew, gray mold, and blight, and from here the importance of the program appears in providing fungicide spraying for each disease separately.

Douglas, *et., al*., (2020) resulted that , leaf removal carried out before veraison during the phenological stages of full bloom, buckshot berries, or pea-sized berries should be recommended for Sauvignon Blanc cultivar production to reduce *Botrytis* bunch rot in the highland regions of Santa Catarina State, Southern

Conclusively, the main objective of the research is to design an integrated control program to combat the powdery mildew of grape disease in addition to combating other associated diseases that appear on grapes, such as downy mildew, gray rot, and flower blight. Three integrated control programs were tested in the dormant stage to compare agricultural fertilizers and fungicide alternatives and compared with the control treatment. It was proven that the best results were obtained in the proposed integrated control program, which covered 0% of the severity of powdery mildew disease, in addition to the percentage of other diseases at the end of the experiment being 0.0%.

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تنفيذ برنامج مكافحة متكامل لمكافحة البياض الدقيقي وتقليل الأمراض النباتية المصاحبة للعنب في مصر

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Uncinula necator . يعتبر مرض البياض الدقيقى فى العنب من أهم الأمراض النباتية التي تصيب العنب والمتسبب عن الفطر وتؤدي الاصابه عموما بمرض البياض الدقيى واعفان الثمار إلى خسارة كبيرة في المحصول. ولذلك كان الهدف الأساسي من البحث هو تصميم برنامج مكافحة متكامل لمكافحة المرض بالإضافة إلى مكافحة باقي الأمراض النباتية التي تظهر على العنب مثل البياض الزغبي والعفن الرمادي ولفحة الأزهار. تم تصميم البرنامج على مدار ٣ مواسم (٢٠٢٢ : ٢٠٢٤). في المواسم الأولى (٢٠٢٢) تم تنفيذ ثلاثة برامج مكافحة كيماوية للفطريات (برنامج المكافحة الكيميائية المقترح وبرنامج المكافحة الكيميائية المعدلة للمانجو وبرنامج المكافحة الكيميائية الأصلي مع المكافحة العامة التي لم يتم علاجها، وتم تقييم جميع برامج المكافحة الكيميائية بالاعتماد على مجموعات كيميائية مختلفة. ، بما في ذلك الوقائية والعلاجية .وكان برنامج المبيدات الفطرية الكيميائية الأكثر فعالية وكفاءة في تقليل المرض هو برنامج المكافحة الكيميائي المقترح والذي أعطى كفاءة عالية في مكافحة البياض الدقيقي (١٥ و ١٨ و ٢١%) من شدة مرض البياض الدقيقي والأمراض المصاحبة له كنسبة مئوية من نسبة الإصابة بالبياض الدقيقي. بلغت نسبة الإصابة بالمرض في نهاية الموسم ١١,١٦% و١٩% نسبة الإصابة بمرض تعفن الثمار في كل امن فلام وسوبريور وطومسون على التوالي. ، تليها المكافحة الكيميائية المعدلة للمانجو والتي خفضت شدة مرض البياض الدقيقي (٢١، ٢٨ و ٣٣٪) أو حدوث الأمراض المرتبطة بها٪ (١٣، ١٨ و ٢٠٪) في فلايم، سوبيريور وطومسون، على التوالي، مقارنة مع السيطرة العامة التي أعطت (٣٣,٣٩,٣٠%). كما أدت المكافحة الكيميائية للمبيدات الفطرية المقترحة إلى خفض نسبة تكرار العزل

في مسببات أمراض عفن الثمار في ظروف المزرعة النوعية ومقارنتها بمعاملة السيطرة في الموسمين الثاني والثالث (٢٠٢٣ و ٢٠٢٤). كما تم اختبار ثلاثة برامج مكافحة متكاملة بين الأسمدة الزراعية وبدائل المبيدات الفطرية ومقارنتها بمعاملة المقارنة. وقد ثبت أنه تم الحصول على أفضل النتائج في برنامج المكافحة المتكاملة المقترح والذي اعطى ٠% من شدة مرض البياض الدقيقي، بالإضافة إلى أن نسبة الأمراض الأخرى في نهاية التجريب ٠% تليها المانجو المعدلة المتكاملة. برنامج المكافحة غطى (٢.٢ و ٤%) من شدة مرض البياض الدقيقي بالإضافة إلى ١% من حالات الإصابة بمرض عفن الثمار مقارنة بالكنترول الذي كان (٧٤ و ٧٤ و ٨٠%) من شدة مرض البياض الدقيقي % كما أن ٣٥% من مرض عفن الثمار Botrytis يسبب ٣٥% من العنب (Film, Superior و .Thomason على التوالي.

التوصية : ثبت أنه تم الحصول على أفضل النتائج في برنامج المكافحة المتكاملة المقترح الذي غطى ٠% من شدة مرض البياض الدقيقي، بالإضافة إلى أن نسبة الأمراض الأخرى في نهاية التجربة ٠.٠%.

الكلمات المفتاحية: البياض الدقيقي، العنب، برامج المكافحة الكيميائية، برامج المكافحة المتكاملة، تعفن الثمار، والأسمدة.