International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Possibility of Using Nanoparticles (ZnNPs, MgONPs) in Keeping Cucurbit Fruit from Infection by *Pythium aphanidermatum*

Halima Z. Hussein, Eman K. Abdul-Karim, Shamael S. Mutar

Assistant Professor, Plant Protection Department, College of Agriculture, University of Baghdad

Abstract: ***Nanoparticles have different mechanical, chemical, electrical, and optical properties that make them suitable for technological and agriculture applications In this study, the results revealed that the effectiveness of nanoparticles (MgONPs,ZnONPs) inhibition the Pythium aphanidermatum. Magnisum oxide nanoparticles, the higher inhibition of the fungus 100%,98.0% followed by zinc oxide nanoparticle 97%,99.80%.***

Keywords: Nanoparticles (magnisum oxide, Zincoxide); Pythium aphanidermatu cucurbit fruit

1. Introduction

Plants are often attacked by various pathogens such as fungi, bacteria and viruses which results in great loss to farmers (Esfahani, 2006). Such as *Pythium aphanidermatum* is a common problem in the growing areas, especially under the moist conditions that generally prevails during sowing. *Pythium aphanidermatum* has a wide host range, and can have economic impact on the cultivation of beets, peppers, chrysanthemum, cucurbits, cotton and turf-grasses . Fungicides are the most common means to check the disease in plants. Several conventional methods have been used for the control of these pathogens and each of these methods has one or other limitations. . Frequent and Intensified uses of these chemicals are hazardous to humans and environment (Cook and Baker, 1983) and leads to environmental pollution .The increasing awareness of fungicide-related hazards has emphasized the need of adopting biological methods as an alternative disease control method Some of these methods such as use of pesticides cause hazardous effect on the environment and human health. Thus, use of nanoparticles has been considered an alternate and effective approach which is eco-friendly and cost effective for the control of pathogenic microbes (Kumar and Yadav, 2009). These nanoparticles have a great potential in the management of plant diseases as compared to synthetic fungicides (Park et al., 2006). Zinc oxide (ZnO) and magnesium oxide (MgO) nanoparticles are an effective antibacterial and anti-odor agent Shah and Towkeer, 2010). The increased ease in dispensability, optical transparence and smoothness make ZnO and MgO nanostructures an attractive antibacterial ingredient in many products. Both have also been proposed as an anti-microbial preservative for wood or food products (Aruoja et al., 2009; Huang et al., 2006; Sharma et al., 2009). Recently, nanosciences and nanotechnology has been leading to a technological revolution in the world, which is concerned with materials with significantly novel and improved physical, chemical and biological properties (Wani and Shah, 2012; Sundrarajan et al., 2012). In this regard, nanoparticles are recognized as antibacterial agents due to their size, structure, and surface properties (Raghupathi et al., 2011)

2. Materials and Methods

Fungal Isolates

An isolate of Pythium aphanidermatum was obtained from infected Cucurbita. Small pieces of infected samples (0.5 cm length) were thoroughly washed by distilled water, dried on filter papers and sterilized by 2% sodium hypochlorite for 2 min. The pieces were then distributed on potato dextrose agar (PDA) media in Petri dishes 9cm diameter. The Petridishes were incubated at 25±2°C for 7 days. The growing fungi were purified by hyphal tip transfer method, and identified.

Assay of antifungal activity On culture media

The extracts Mgo, Mgo Nano, Zno, Zno Nano were added into PDA media at of 0.5, 1, 2 and 3gm/ 100 ml. A disc of 0.5 cm diameter of fungal culture on PDA of 7 days old was placed at the center of each petridishes and incubated at 25±2ºC (3 replication for each concentration). The inhibition of fungal growth was calculated as following: % inhibition = (dc – dt)/dc x 100. dc = average diameter of linear growth in control. dt = average diameter of linear growth in treatment

Under storage conditions

Under storage conditions Two concentrations of Mgo , Mgo, Zno, Zno 0.5 were used for evaluating the antimicrobial activity under storage conditions. three pieces of Cucurbita were dipped in each concentrations for 1 minutes, air dried at room temperature and maintained in plastic boxes (60×40×30 cm). For Cucurbita inoculation, discs of 0.5 cm diameter taken from fungal culture of 5 days old were inserted in holes of 0.5 cm diameter done in Cucurbita pieces. The treatments were maintained at 10±1°C and 90± 5% relative humidity with 3 replications. The number of rotten of Apple was registered and the disease severity was calculated using a disease index of 5 degree. for disease severity on carrot, a disease index depending on rotted lesion area on inoculated pieces was adopted,: 0=0% (no infection); 1= The lesion covered 1–25% of Cucurbita pieces; 2= The lesion covered 26– 50% of Cucurbita pieces; 3= The lesion covered 51–75% of Cucurbita pieces; 4= The lesion covered 76–100% of Cucurbita pieces (Kobriger &

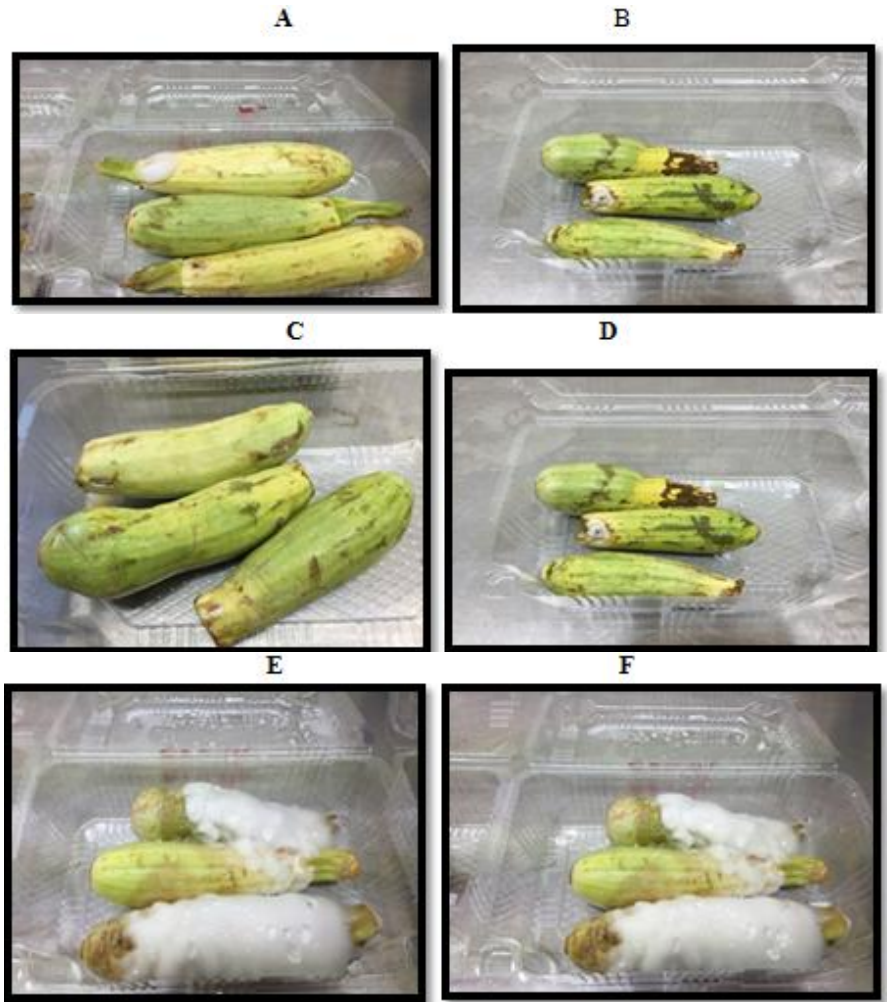
Hagedorn 1983). %Disease severity =Σ(severity class× no. roots in class)/(total no. of roots × highest class No.)×100.

3. Results

Results showed that (table 1) the effectiveness of nanoparticles of inhibition *Pythium aphanidermatum* . The higher inhibition 100% compare with control. The results of which are referred to in the table (1) and FIG. (1)

Table 1: Efficiency of nanoparticle (Zn , Mgo) on growth of *Pythium aphanidermatum.*

Treatment	*Inhibition %*
Zn NPs	100.00
ZnNPs	100.00
MgONPs	100.00
MgOM	100.00
Control	0.00
LSD* (P<0.05	12.75



A=znNPs B -ZNMPS C=MgONPs D=mgOMPS E,F=control

Results showed (table 2) significant difference of guide disease among all treatment, the treatment ZnoNPs ,MgoNPs less guide disease (before and after infection) range 5.53,8.20,2,7 respectively compare with control recorded 90.40 followed treatment nonn-nanopaarticle 5.53,8.30 2.77,5.33 , this results agreement with Brayney (2006) who reported that the use Zinoxide nanoparticle leded to inhibition of the growth *pencilium expnsum* due to deformation of hypha structure also its responsible to physiological change of the fungus.

Table 2: Efficiency of nanoparticle (Zn , Mgo)

Treatment	Before	After	LSD
ZnNPS	4.79+_ 8.30	2.5+_5.53	0.22
ZnMPs	1.75+2.77	1.75+_2.77	0.00
MgoNPs	0.00+_0.004.	1.75+_2.77	2.76
MgoMps	4.79+-8.30	2.50+_2.50	5.22
Control	2.80+-9.40	2.80+_9.4	0.00
LSD	11.44	12.94	

Results showed that (table 3) the different significant of all treatment, Magnesium oxide nanoparticle treatment higher inhibition of 100%, 98.0% compared to control 0.00. Followed by Zinic oxide nanoparticle of 97.56 and 99.80. This resulted agreement with yehia (2013) noted that the use znonanoparticle and MgO nanoparticle helped to inhibition of inhibition of germination spore of *pencillium expansum* and *Fusarium oxysporium* .Also chorones (2005) significant decline of growth fungus when using silvernanoparticles. Also Abdul –Hassan and Hussein (2016) reported that AgNPs, MgoNPs were effective to inhibit the growth and development of *Fusarium solani*

Table 3: Efficiency of ZnoNPs, ZnoMPs, MgONPs, MgOMPs of inhibition *Pythium aphanidermatu*

Treatment	Inhibition%	Inhibition%
ZnNPs	97.56	94.80
znmPs	91.38	94.90
mgoNPs	100	98.3
Mgomps	90.53	97.10
Control	0.00	0.00
LSD((P<0.05	11.24	11.39

4. Conclusion

Results of the current study reveal that the application of nanoparticles(ZnONPs, MgONPS) exhibited high activities against Pythium aphanidermatum

References

[1] Avanzato, C. T., Follieri, J. M. and Banerjee, I. A., Biomimetic synthesis and antibacterial characteristics of magnesium oxide-germanium dioxide nanocomposite powders. Journal of Composite Materials, 43, 897-910 (2009).
[2] Cook, R.J. and Baker, K. (1983). The Nature and Practice of Biological Control of PlantPathogens. American Phytopathological Society, St. Paul, MN. 539 p.
[3] Esfahani MN. Present status of Fusarium dry rot of potato tubers in Isfahan (Iran). Indian Phytopathology 2006; 59 (2). 142-147.
[4] Feiner LF. Nanoelectronics: crossing boundaries and borders. Nat. Nanotechno. l2007; 1. 91–92.
[5] Falah Abdul Abdul-Hasan, Halima Z. Hussein (2016)Evaluation of Antifungal Effect of Nanoparticles(Magnesium Oxide,Silver) and Chemical (Phylax) on Fusarium Solani f.sp Cucurbitae, PathogenicAgent of Melon International Journal of Agriculture Innovations and Resear h Volume 5, Issue 2, 2319-1473
[6] Kumar V, Yadav SK. Plant-mediated synthesis of silver and gold nanoparticles and their applications, J. Chem. Technol. Biotechnol. 2009; 84. 151–157.
[7] Park HJ, Kim SH, Kim HJ, Choi SH. A new composition of nanosized silica–silver for control of various plant diseases, Plant Pathol. Journal. 2006; 22. 25-34.
[8] Raghupati, R. K., Koodali, R. T. and Manna, A. C., Size-dependent bacterial growth inhibition and mechanism of antibacterial activity of zinc oxide nanoparticles. Langmuir, 27, 4020-4028 (2011).
[9] Shah MA & Towkeer A. Principles of Nanosciences and Nanotechnology, Naroosa Publishing House, New Delhi, (2010).
[10] Shah MA & Quarshi A. Novel surfactant free synthesis of MgO nanoflakes. J. of alloys and Comp. 2009; 252. 583.
[11] Sharma V K, Yngard RA & Lin Y. Silver nanoparticles: green synthesis and their antimicrobial activities. Adv. Colloid Interface Sciience 2009; 145. 83–96
[12] Sundrarajan, M., Suresh, J. and Gandhi, R. R., A comparative study on antibacterial properties of MgO nanoparticles prepared under different calcination temperature. Digest Journal of Nanomaterials and Biostructures, 7, 983-989 (2012).
[13] Wani, A. H. and Shah, M. A., A unique and profound effect of MgO and ZnO nanoparticles on some plant pathogenic fungi. Journal of Applied Pharmaceutical Science, 2, 40-44 (2012).