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The Effect of some Plant Extracts Against TYLCV on Tomato Plants

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Summary. An assay performed in a college of agriculture, Misan University, Iraq, in a greenhouse during 2020 to study the antiviral effect of five aqueous extracts belonging to plants, including clove *Syzygium aromaticum*, harmal *Peganum harmala*, banana *Musa acuminata*, black cumin *Nigella sativa*, and lemon *Citrus limon* against the virus that infects tomatoes called (Tylcv). The harmal extract was significantly superior in increasing plant length (54.1 cm) compared to other treatments and gave a significant increase in leaf area (16.8 cm), whereas the lemon extract showed a notable decline in the incidence of disease (32.8%) and intensity of disease (0.6%) compared with control (67.6% and 2.4%, respectively). When compared to the control treatment of 4.6 cm, harmal extract significantly increased the leaf area by 16.8 cm. Extracts of bananas, lemons, cloves, and black cumin followed suit, with increases of 13.4, 15, 2, 4, and 11.8 cm.

1. Introduction

There are pathogens such as viruses, bacteria, and fungi that infect tomato plants and reduce their production [1, 2, 3]. The virus (Tylcv) can cause massive damage to tomato production in Iraq if it doesn't control the carrier factor (whitefly) by using insecticides, hence, it is now essential to adopt environmentally friendly alternatives to control TYLCV.

Many strategies were developed to control plant viruses, but they were ineffective in preventing or avoiding viral infections when compared to active management of bacteria and fungi, particularly through chemical methods. To some extent, plant viruses cannot be directly controlled, so there is an increasing need for antiviral substances [4]. There are different kinds of effective phytochemicals in the numerous plants that were specified as virus inhibitors, viz., polysaccharides, peptides, flavonoids, lignin, proteins, alkaloids, terpenoids, coumarin, and tannins [5]. Banana *Musa acuminata* has useful compounds that are antiviral, antifungal, and antimicrobial. [6]. [7, 8] reported that clove oil, *Syzygium aromaticum*, possesses antiviral activity. According to [9, 10], harmal *Peganum harmala* contains alkaloids with antiviral properties. [11] reported that *Citrus limon* has antiviral activity. [12] also reported that black seed has an antiviral impact. A study aimed to assess the aqueous extracts activity of clove, *Syzygium aromaticum*, harmal *Peganum harmala*, banana *Musa acuminata*, black cumin, *Nigella sativa*, and lemon, *Citrus limon* against TYLCV disease on tomatoes.

2. Methods and Materials

This assay was performed in the Agriculture Faculty, Misan University, Iraq, in a greenhouse during 2020. Tylcv was- isolate acquired from Misan University, which preserved on the tomato plants, while seedlings of tomato plants (cv. Foton) were acquired from Misan Nursery. Five plant powders were collected from the local market in Misan City, Iraq, in 2020, which included clove *Syzygium aromaticum*, harmal *Peganum harmala*, banana *Musa acuminata*, black cumin *Nigella sativa*, and lemon *Citrus limon*. Plant extracts of banana, lemon, and black seed were prepared as aqueous extracts by mixing 50 g of each with dw (500 ml), then passing through a double-layered cloth three time, the mixtures were centrifuged at 3000 RPM for three to ten minutes, and until they were needed, the supernatants were kept in the refrigerator, whereas plant extracts of clove and harmal were prepared as alcoholic extracts by following the same steps but using alcohol instead of water.



Tomato seedlings were moved into plastic pots at the age of sixty days with a dimension of 20 cm by 20 cm, the pots contain sterilized soil (2 kg) and peat moss at a ratio of 3:1. The assay consist of six treatments using CRD design, and including the plant extracts (clove, harmal, banana, black cumin, and lemon) with five replications, and each of them contained one plant; the plants of control were sprayed with (DW); the analysis of the data was done by ANOVA [13]. We reared virus-free whiteflies on cotton plants (*Gossypium hirsutum*) in protected cages with muslin, measuring 100 x 100 x 100 cm. We gave 20 whiteflies an acquisition feeding period (24 hours) on infected tomato plants by Tylcv-Bsr in insect cages; we transferred 10 insects per plant to healthy plants at the 2-leaf stage for a 72-hour feeding period, and then sprayed the plants with insecticide to kill the whiteflies. We sprayed the plants with the previous plant extracts on March 10, 2020, and again on March 24, 2020, following the appearance of virus symptoms. We recorded the disease severity, disease incidence, leaf area, and plant length 40 days after the symptom appearance. The incidence of disease was accounted according to:

Incidence of disease = injury plants number/all plants $\times$ 100

Intensity of disease was determined on a scale of zero to four [14], and determined using the formula as given by [15].

Intensity of disease = Sum of scale $\times$ infected plants number/high of score $\times$ all plants $\times$ 100

3. Results and Discussion

The findings of Fig (1) show that the extract of harmal was significantly superior in increase of plant length 54.1 cm compared to other treatments such as clove 33.9 cm, lemon 32 cm, banana 30 cm, black cumin 29.1 cm and control 24 cm.

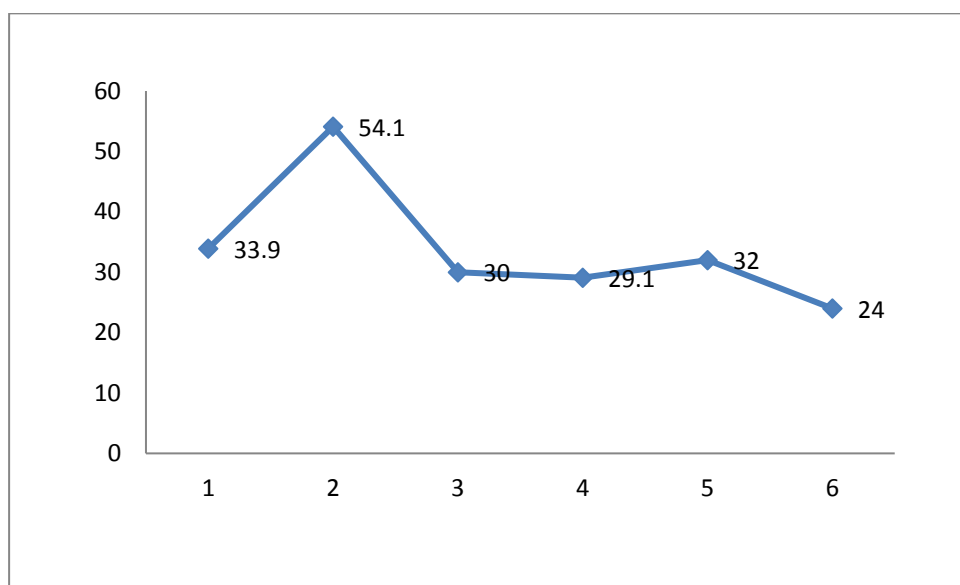


Figure 1. Effect of plant extracts (clove, harmal, banana, black cumin, and lemon) on infected tomato plants length by the TYLCV virus on tomato

Also harmal extract gave a significant increase in leaf area 16.8 cm followed by extracts of banana 13.4 cm, lemon 13.2 cm, clove 12.4 cm, black cumin 11.8 cm compared with the control treatment 4.6 cm (Fig 2).

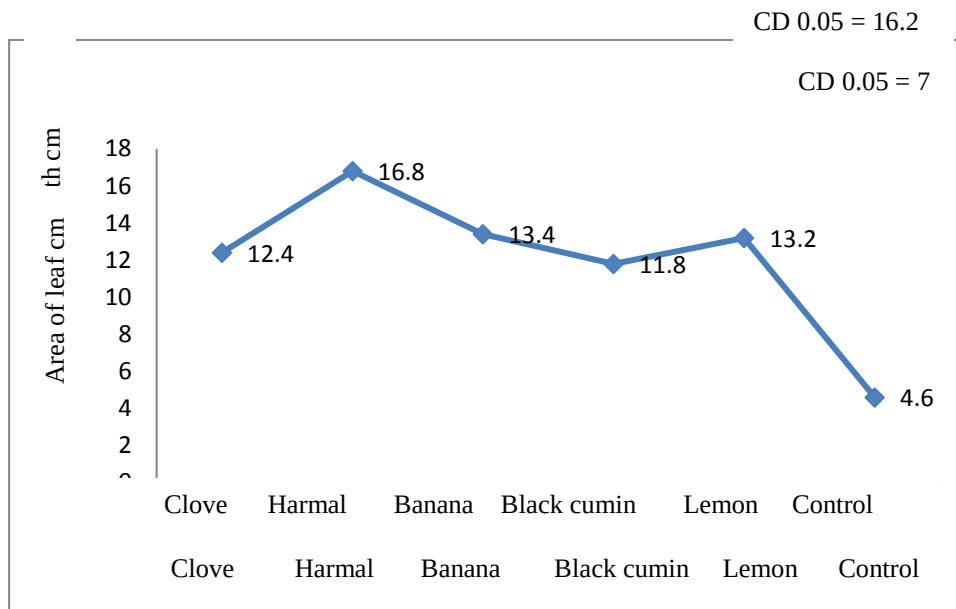


Figure 2. Effect of plant extracts (clove, harmal, banana, black cumin, and lemon) on infected tomato plants leaves area by the TYLCV virus on tomato

The lemon extract exhibited a significant antiviral effect through the decrease of disease incidence 32.85%, followed by extracts of black cumin 41.6%, clove 46%, harmal 56% compared to control 67.6% (Fig 3).

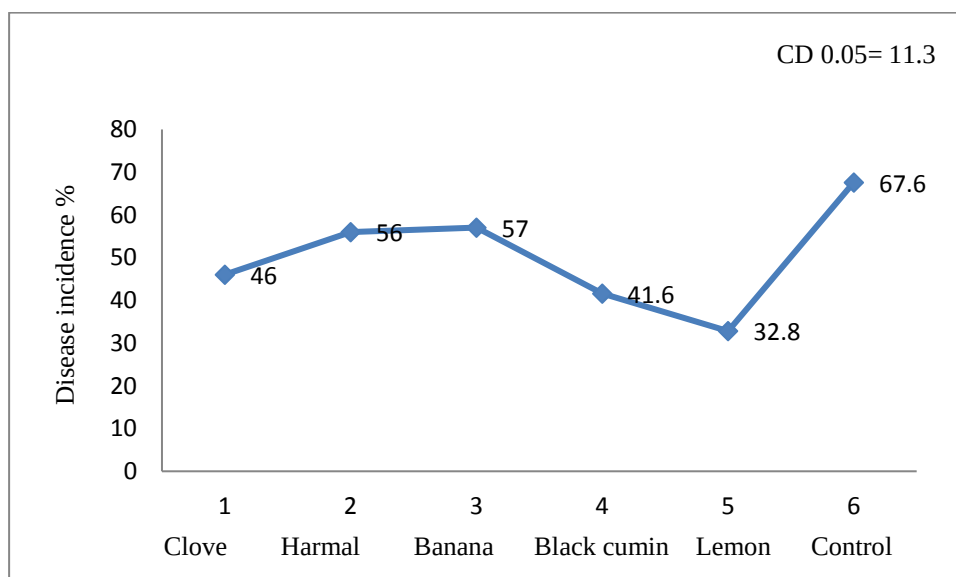


Figure 3. Effect of plant extracts (clove, harmal, banana, black cumin, and lemon) on disease incidence by the TYLCV virus on tomato

As well the lemon extract showed a decrease of disease severity 0.6%, followed by extracts of black cumin 1%, harmal 1.2%, clove 1.4% compared to control 2.4% (Fig 4). Clove oil led to inhibition of the (YMV) virus in faba bean [16].

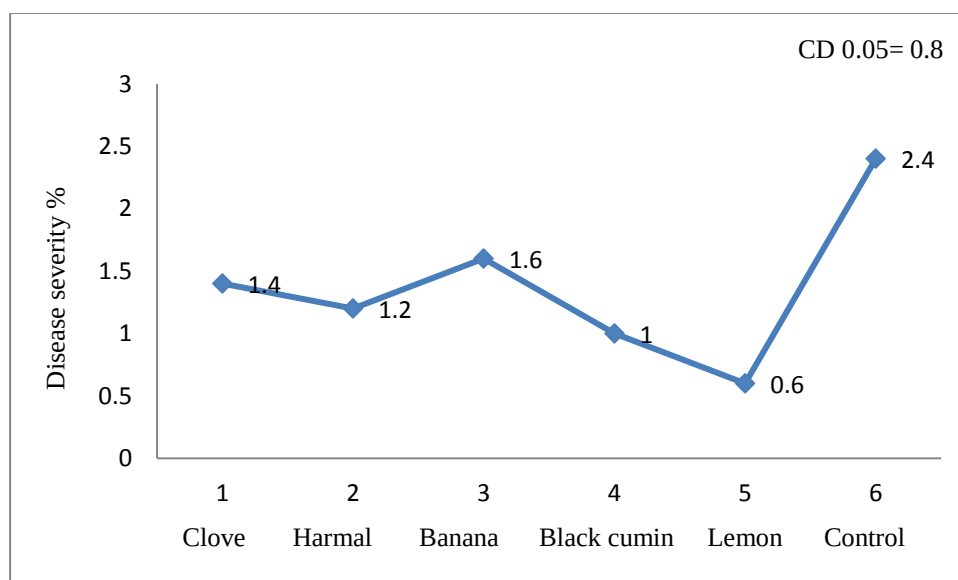


Figure 4. Effect of plant extracts (clove, harmal, banana, black cumin, and lemon) on disease severity by the TYLCV virus on tomato

The clove oil effect is attributed to eugenol, which acts as an enhancer of systemic resistance versus the TYLCV. [7,8] reported that clove oil led to suppression the potato virus. [17] stated that clove oil caused maximum inhibition of (PVY) on pepper. *Nigella sativa* extract possesses antimicrobial and antiviral activities [18], also, black cumin oil has essential curative results against viral and bacterial infections. Black seed has an antiviral effect [19]. The harmal with its alkaloids has several activities against harmful organisms, which act as antiviral [9,10]; antibacterial; and antifungal [20]. and insecticidal [21]. *P. harmala* possesses antiviral, antifungal, and antibacterial effects [22]. Lemon and citrus peels are an excellent source of biologically active compounds known as flavonoids that possess active properties versus viruses, fungi and bacteria.

4. Conclusion

The extracts of clove, harmal, banana, black cumin, and lemon showed potential as antiviral agents against the TYLCV virus in tomato plants.

Acknowledgements

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References

- [1] McGovern R J. 2015. Management of tomato diseases caused by *Fusarium oxysporum*. *Crop Protect*, **73**: 78-92.
- [2] Jones J B, Zitter T A, Momol T M, and Miller S A. 2016. Compendium of Tomato Diseases and Pests, Second Edition. APS Publications.
- [3] Salim H A, Simon S, and Lal A A. 2017. Integrated diseases management (IDM) against tomato (*Lycopersicon esculentum* L) fusarium wilt. *Journal of Environmental and Agricultural Sciences*, **11**: 29-34.

- [4] Jabar A K, Salim H A, and Khamas N A. 2021. Antiviral Activity of Banana Extract against Tomato Yellow Leaf Curl Virus (TYLCV), *Indian Journal of Ecology*, **48**: 341-342.
- [5] Jassim S A A, and Naji M A. 2003. Novel Antiviral Agent: A Medicinal Plant Perspective. *Journal of Applied Microbiology*, **95**: 412–427.
- [6] Jyothirmayi N, and Rao M N. 2015. Banana Medicinal Uses. *Journal of Medical Science and Technology*, **4**: 152–160.
- [7] Bhowmik D, Kumar S K P, Yadav A, Srivastava S, Paswan S, and Dutta A S. 2012. Recent Trends in Indian Traditional Herbs *Syzygium aromaticum* and its health benefits. *Journal of Pharmacognosy and Phytochemistry*, **1**: 13-22.
- [8] Iftikhar S, Shahid A A, Javed S, Nasir I A, Tabassum B, and Haider M S. 2013. Essential oils and latices as novel antiviral agent against *Potato Leaf Roll Virus* and analysis of their phytochemical constituents responsible for antiviral activity. *Journal of Agricultural Science*, **5**: 167-188.
- [9] Asgarpanah J, and Ramezanloo F. 2012. Chemistry, pharmacology and medicinal properties of *Peganum harmala* L. *African Journal of. Pharmacy and Pharmacology*, **6**:1573-1580.
- [10] Kiani S, Shamsi Shahrabadi M, Ataei A, and Sajjadi N. 2008. *Peganum harmala* seed extract can prevent HSV-1 replication in vitro. *Iranian Journal of Virology*, **4**:1-16.
- [11] Reza-Tofighi S E, Ebrahimian M, Lordifar P, Mehravar N, and Sirnejad S M. 2014. Antiviral Activity of *Citrus Limon*, *Matricaria recutita* L., *Allium ascalonicum* L. and *Rosa damascene* against Newcastle Disease Virus, *Journal of Veterinary Microbiology*, **10**:1.
- [12] Chaieb K, Kouidhi B, Jrah H, Mahdouani K, Bakhrouf A. 2011. Antibacterial activity of Thymoquinone, an active principle of *Nigella sativa* and its potency to prevent bacterial biofilm formation. *BMC Complement Altern Med*, **11**:29.
- [13] Fisher R A, and Yates. 1968. Statistical method for research workers. Oliver and boyd ltd. Edinburgh and London, 10. <http://www.ccari.res.in/wasp/index.php>
- [14] Lapidot M, Friedmann M, Pilowsky M, Ben-Joseph R, and Cohen S. 2001. Effect of host plant resistance to tomato yellow leaf curl virus (TYLCV) on virus acquisition and transmission by its white fly vector. *Phytopathology*; **91**: 1209-1213. <https://goo.gl/r6nvXq>
- [15] Raupach G S, Liu L, Murphy J F, Tuzun S T, and Kloepper J W. 1996. Induced systemic resistance in cucumber and tomato against cucumber mosaic cucumovirus using plant growth-promoting rhizobacteria (PGPR). *Plant Dis*; **80**:891- 894. <https://goo.gl/1BCdsj>
- [16] Alkuwaiti N A, Sabier L J, and Hatem M W. 2016. Antiviral activity of clove and bitter almond oils against bean yellow mosaic virus (BYMV) infecting faba bean in iraq, *World Journal of Pharmaceutical Research*, **5**: 6.
- [17] Shafie R M, Kheder A A, and Farghaly A A. 2017. Induction of resistance in pepper plants against potato virus y (pvy)ntn by two medicinal and aromatic plant essential oils and their major components. *Egyptian Journal of Phytopathology*, **45**: 1-15.
- [18] Bakathir H A, and Abbas NA. 2012. Detection of the antibacterial effect of *Nigella sativa* ground seeds with water. *Afr J Tradit Complement Altern Med* **8**:159–164.
- [19] Umar S, Shah M A, Munir M T, Yaqoob M, Fiaz M, and Anjum S. 2016. Synergistic effects of thymoquinone and curcumin on immune response and anti-viral activity against avian influenza virus (H9N2) in turkeys. *Poultry Science*, **95**:1513-20.
- [20] Nenaah G. 2010. Antibacterial and antifungal activities of (beta)-carboline alkaloids of *Peganum harmala* (L) seeds and their combination effects, *Fitoterapia* **81**:779-782.
- [21] Kadhim A D, Salim H A, and Abed M S. 2015. Efficacy of Harmal *Peganum harmala* on Rice weevil *Sitophilus oryzae* L in the stored Rice grains, *Uropean Academic Research*, **3**:7506-7514.
- [22] Darabpour E, Poshtkoughian Bavi A, Motamedi H, and Seyyed Nejad S M. 2011. Antibacterial activity of different parts of *Peganum harmala* L. growing in Iran against multi-drug resistant bacteria. *Excl. Journal*, **10**: 252- 263.