

Miticidal Evaluation of Different Non-Volatile Bioactive Compounds Extracted from *Ferula Oopoda* Against Apple Mites

Ahmed Saeed*, Nizam Baloch, Taimur Qambrani, Sheraz Khan, Shahbaz Khan and
Muhammad Asif

Faculty of Basic Sciences, Department of Chemistry, University of Balochistan, Quetta 87300-Pakistan

Article's Information

Received:
15.01.2021
Accepted:
06.03.2021
Published:
13.03.2021

Keywords:

Ferula oopoda
Miticidal
Rotary evaporator
Extract
Basification
Mortality

Abstract

The research was administered in order to spot the miticidal effect of wild grown plant namely *Ferula oopoda* against the mites that destroy the leaf tissue and also the colour of the fruit in trees. The theme was to get the herb's (1) aerial, stem and root part about 1 kg and was soaked for about 7 days and then extract the oil by the help of vacuum rotary evaporator, the extracted oil is then allowed to stay for a day in HCl (0.2M), then the solution is filtered and then some charcoal is added to the filtrate and now, it is put on the Bunsen burner for a while, now the HCl extract is again filtered and basified by the addition of Sodium hydroxide (5M), the yellow colour is the indication of basification and now the ppts are collected that are formed over the filter paper, the ppts are dried and later on sprayed on the apple mites and their mortality rates are noted at exposure time of 6, 12, 24, 36 and 48h. It may be a new revolutionary technique that can be economical as well as environment friendly as the oil is only lethal for the target apple mites and doesn't not harm human health.

DOI: 10.22401/ANJS.24.1.03

*Corresponding author: achakzai814@gmail.com

1. Introduction

The 21st century is counted for the peak in population of humankind which is even increasing slowly and gradually with the help of more and more industrial revolution, in the same way a rise in the usage of medicinal drugs and artificial drug production has been seen throughout the world. By keeping in mind, the above scenario there are many plants found in different areas of Pakistan i.e., districts of Baluchistan which has got some areas of research for scholars. These medicinal herbs are full of medical usage, besides many insecticidal and miticidal effects. Among a variety of plants *Ferula oopoda* (boiss & buhse) is the most important plant that belongs to genus *ferula* in apiaceae family. Medically it is used to cure problems of worms (intestinal), hemorrhoids and digestive issues [1].

Ferula oopoda is a native species of northern Baluchistan in Pakistan which grows to maximum height 2 m, with 4-pinnate, it has got segmented leaves. *F. oopoda* has its phytogeographical attachment to the areas of Mediterranean and central Asia [2]. Generally *f. oopoda* has around 170 species and is the largest genera of apiaceae [3]. It is also utilised for asthmal treatments coughing, respiratory ailments headache and diaphoretic purposes.

There are eleven compounds which include three monoterpene phenyl esters (first three terpenes), [1] a

monoterpene glucoside (4th terpene), five sesquiterpenoids (fifth to sixth terpenoids), phenolic acid glucosides (10th terpene), uridine (eleventh terpene). These were actually extracted from upper parts of *ferula oopoda* boiss. Structure elucidation was done by using 1D and 2D NMR spectroscopy and data was also reported with previously reported data.

Prior researches have brought to view the fact that this medicinal plant has many non-volatile bio- active compounds which can be got through extraction methods [4].

Ferula oopoda that is the most important genera of the botanical family umbellifera, more than 133 active and alive species of *ferula* genus are spread over Mediterranean area and central Asian countries such as Pakistan, Iran, Sudan, Saudi Arabia etc. Its Iranian flora is having about more than 30 species of *ferula* that includes 15 endemics and the most common name of this botanical specie is (Koma) Iranian name. Many plants of these special medicinal genera have been utilised as folk medicine for their sedative effects, digestion and aphrodisiac properties and have treated worms (intestinal) and haemorrhoids in different regions of Turkey [5]. In addition, the methanol formed extract is shown with a lot of anti-plasmodium action. Many more reports can be approached on Phyto-chemical activity of these genera through literature present online. There has been many

sesquiterpenoids isolated from roots and aerial parts including seeds of ferula oopoda.

The major residues that were found in the microcolea boiss was alpha-pinene (19 %), nonane (13 %), and some beta-phellandrene (13 %), moreover alpha pinene (15.4 %) and thymol was about (14.9 %) were identified in the latter. As far as we know the oil composition of the wild ferula plant that is ferula oopoda (boiss and bushes) and that of that of ferula badghysi (korovin) that are morphologically and structurally just the same as that found in mountainous areas of Iran, but ferula oopoda has not been worked on at any levels except for that ferula oopoda and badghysi was hydrodistilled (the leaves, seeds,) and the collection was done from eastern part of Iran and GC and MS was also applied [6,7,8].

Facts about ferula oopoda

Ferula plant can be found easily in the areas of Baluchistan especially Quetta (eastern areas) of hazaar gangi where its plant has many sizes in height from few inches up to 4 feet. This plant has an attracting smell and it is locally used for digestive problems by local residents. Its local name is (injaa) or (inzaa). It has many local and synthetic uses besides medical importance. This plant can be collected at the start of April when the plant is quite fresh and green coloured while it's ending time collection may be the month of October, however its dried stem and roots can still be dug out at any time in the whole year.

1.1 Problem statement

Teanychus urticae, is also known as spider mites or double spotted mite which is a feeder and attacker on a variety of plants as well as trees of different genus [9,10,11]. It may cause harm to herbicidal plants and as well as roses and many other plantae specie [12,13].

Apple mites usually eat flowering portion and sap from the foliage of plants, however most of the time they remain undetected due to their sizes which range generally from 0.4 to 0.6 micrometres [14,15]. Baluchistan is very much popular for its fruit productions such as cherries, carrots, grapes and above all apple which is a very productive fruit but its productivity quite affected due to miticidal attack on the early plant growths. In addition, the yield of apples is decreasing day by day due to seasonal attacks of mites which has to be combated seriously.

Another serious issue is that pesticides made synthetically are more health alarming and environment unfriendly which may cause cancer, asthma, and pneumonia infections to old people and foetus. But the natural herbs are more environment friendly besides having less damage to soil and environment.

1.2 Significance

Significance of this research work is based on extraction of non-volatile bio-active compounds mostly alkaloids that

are present in Ferula oopoda which would have an effective result in decreasing the population of apple mites.

1.3 Research objectives

- To prepare crude extract from upper parts of ferula oopoda.
- To extract non-volatile active compounds i.e., alkaloids from crude extract.
- To apply the extracted alkaloids as miticide against apple mites i.e., on tetranychus species

2. Methods and Materials

2.1 Plant collection and drying

Samples will be collected hopefully from areas of Quetta, Baluchistan from national park of Hazaar ganji near lak pass as the area is replete with Ferula oopoda plants of different sizes and colour. The collected plants will be dried under a shadowy place at normal temperature to get the moisture of plant evaporated completely.

Certification of the plant would be done in the presence of Taxonomist at Department of botany University of Baluchistan.

2.2 Crude extraction of non-volatile compound

Firstly, the plant (F. oopoda) around 1kg will be taken and dried under a calm shadow and then grinded fully and then the crushed plant is placed in a container containing 2liters ethanol (concentrated) and it is further left in the solvent ethanol for at least a week. Then filtrate is concentrated by using vacuum rotary evaporator that is used lower the atmospheric pressure of the container in which we have the solution under the vapor pressure that in turn causes the liquid to evaporate under the lower temperature than the normal boiling point of that particular liquid or solution. This process may be applied many times as per the need of the essential oil. Now the alkaloid is let to stand for a complete day in HCl (0.2M). This highly concentrated extract will be the filtered under Whatman filter paper 1, after the filtration some amount of activated charcoal is added to the filtered solution now it is boiled for 20 minutes with low flame.

The heating removes the congeal if present of chlorophyll, the HCl extract gotten is once again very carefully filtered which is later on basified in the presence of (NaOH 5M), now the light-yellow colour is the indication of the basification and the presence of alkaloids. Now the precipitates are collected over the filter paper and is dried in desiccator.

2.3 Effects of alkaloids on apple mites

The alkaloids formed of different concentrations will be applied (sprayed) on mites and their death rate will be determined at different time intervals, i.e., 6, 12, 18, 24 and 48 hours in addition it will be compared to control groups of mites as shown in Table 1.

Table 1. Mortality rate of apple mites at different exposure time.

Serial number	Temperature in degree Celsius	Exposure time in hours	Number of apple mites per petri dish	Number of mites died	Number of mites not affected
1	Room temperature	6	30	4	24
2	Room temperature	12	30	9	21
3	Room temperature	18	30	15	15
4	Room temperature	24	30	24	6
5	Room temperature	48	30	30	0
6	Room temperature	Control group	30	0	0

2.4 Application of the oil against apple mites

Now 6 petri dishes were taken and they were covered with a piece of filter paper from inside where about 30 mites were placed in each petri dishes. Figure 1 below shows the mortality rate of mites taken from different trees gotten from University of Baluchistan and Chiltan national park Hazaar ganji Quetta, Pakistan.

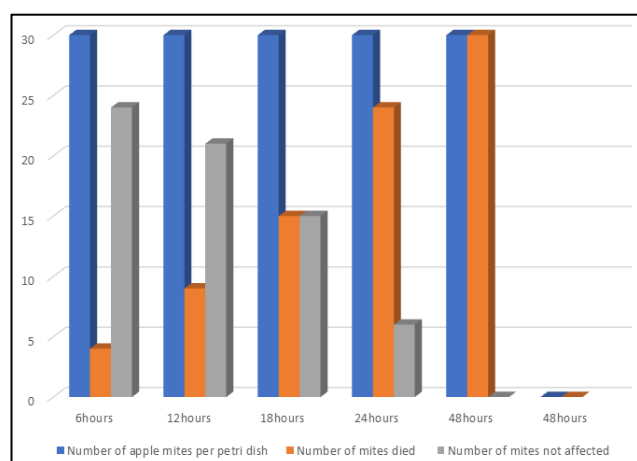


Figure 1. Mortality rate of apple mites at different time intervals.

3. Results and Discussion

The results proved to be time and dosage dependent and the ratio of alive and dead mites confirm the accuracy in assay utilization and its propagation. In addition, the attained records have shown to be an effective way to prevent specie from attack of several regional mites. Furthermore, *F. oopoda* has proved to be a very utilitarian and advantageous vegetation that is gaining plenty of restorative and medicating stuff, that is why the said plant was area of exploration against the apple mites that has too less negative response against the environment, it is also prudent and time saving technique for spraying against the mites at contrasting combinations. If the herb is grown widely and its distillate and extractions are administered worldwide so the essential oil can bring about much chemical revolution at larger level.

4. Conclusion

The chemical as well as phytochemical deep assay of the aerial parts, roots, stems and plant portion has shown the presence of many metabolites such as primary and secondary metabolites such as some of the carbohydrates, a few glycosides, and alkaloids such as sesquiterpenoids and sesquiterpenoids, etc., and in minor amounts tannins. The results that were gotten in the ethanol extract of *Ferula oopoda* aerial as well as underground parts may be considered as the best herbal plants that may work against the mites and ticks if sprayed at different passages of time under simple and hard conditions of temperature and humidity. They may be too much economical for the agriculturists and botanists due to their deep surge and antiquity. They are the best pathogens and good for the digestive diseases such as diarrhoea etc.

Acknowledgement

The author is much obliged to the humbleness and cooperative behaviour of the local administration that stayed deeply with us to help out the difficulties in the study areas and special thanks goes to Prof. Dr Nizam Baloch, Chairperson of Chemistry department, University of Balochistan Quetta and Associate Professor Dr Taimoor Khan Qambrani who belongs to Lasbella University of Agriculture and Marine Sciences and also all the colleagues who worked day and night with me.

References

- [1] Akhgar M.R., Moradalizadeh M., Faghihi-Zarandi A. and Rajaei P., "Chemical Composition of the Essential Oils of *Ferula oopoda* (Boiss. & Buhse) Boiss. and *Ferula badghysi* (Korovin.) from Iran", *Journal of Essential Oil-Bearing Plants*, 14(3), 297-301, 2011. <https://DOI:10.1080/0972060X.2011.10643937>.
- [2] Seyyed Majid Bagheri, Amirhossein Sahebkar, Ahmad Reza Gohari, Soodabeh Saeidnia, Maryam Malmir and Mehrdad Iranshahi, "Evaluation of cytotoxicity and anticonvulsant activity of some Iranian medicinal *Ferula* species", *Pharmaceutical Biology*, 48(3), 242-246, 2010. <https://DOI:10.3109/13880200903081796>.
- [3] Yunes Panahi, Mahboobeh Sadat Hosseini, Nahid Khalili, Effat Naimi, Muhammed Majeed, Amirhossein Sahebkar, 34(6), 1101-1108, December 01, 2015. <https://DOI.org/10.1016/j.clnu.2014.12.019>.

- [4] Shazia Iqbal, Sultana Arifeen, Ali Akbar, Shaista Zahoor, Saima Maher, Noreen Khan, Hafsa Anwar and Ashif Sajjad, "Phytochemical screening and antibacterial assay of the crude extract and fractions of *Ferula oopoda*", *Pure and Applied Biology*, 8(1), 742-749, 2019. <http://dx.doi.org/10.19045/bspab.2019.80016>.
- [5] Tokul-Olmez O., Kaplaner E., Ozturk M., Ullah Z. and Duru M. E., "Fatty acid profile of four *Ganoderma* species collected from various host trees with chemometric approach", *Biochemical Systematics and Ecology*, 78, 91-97, 2018. <https://DOI.org/10.1016/j.bse.2018.03.008>.
- [6] Zohreh Koorki, Shahnaz Shahidi-Noghabi, Kamran Mahdian and Mohammadreza Pirmaoradi, "Chemical Composition and Insecticidal Properties of Several Plant Essential Oils on the Melon Aphid, *Aphis gossypii* Glover (Hemiptera: Aphididae)", *Journal of Essential Oil-Bearing Plants*, 21:2, 420-429, 2018. <https://DOI: 10.1080/0972060X.2018.1435308>.
- [7] Mohaddese Mahboubi and Ferula Gummosa, "A Traditional Medicine with Novel Applications", *Journal of Dietary Supplements*, 13(6), 700-718, 2016. <https://DOI: 10.3109/19390211.2016.1157715>.
- [8] Athanasios C. Kimbaris , Dimitrios P. Papachristos , Antonios Michaelakis , Angeliki F. Martinou & Moschos G. Polissiou, "Toxicity of plant essential oil vapours to aphid pests and their coccinellid predators", *Biocontrol Science and Technology*, 20:4, 411-422, 2010. <https://DOI:10.1080/09583150903569407>.
- [9] Xing Y., Li N., Zhou D., Chen G., Jiao K., Wang W., Si Y. and Hou Y., "Sesquiterpene coumarins from *ferula sinkiangensis* act as Neuroinflammation inhibitors", *Planta Medica*, 83(01/02), 135-142, 2016. <https://DOI.org/10.1055/s-0042-109271>.
- [10] Prasad Paindla and Estari Mamidala, "Infectious Diseases & Metabolic Disorders Research Lab", Department of Zoology, Kakatiya University, Warangal-506 009, Andhra Pradesh, India, Volume-IV, Issue-I, Jan-Feb 2014.
- [11] Pankaj Saini, Ashish Goel, Dushyant Kumar and Tech B., 4th Year Student, Department of ME, Moradabad Institute of Technology, Moradabad, Uttar Pradesh, INDIA, *International Journal of Innovative Research in Science, Engineering and Technology*, 2(5), May 2013.
- [12] Lukas, B., et al., "Essential oil diversity of European", *Origanum vulgare*, L. (Lamiaceae). *Phytochemistry*, 2015. <http://dx.doi.org/10.1016/j.phytochem.2015.09.008>.
- [13] Tokul-Olmez O., Kaplaner E., Ozturk M., Ullah Z., and Duru M. E., "Fatty acid profile of four *Ganoderma* species collected from various host trees with chemometric approach", *Biochemical Systematics and Ecology*, 78, 91-97, 2018. <https://DOI.org/10.1016/j.bse.2018.03.008>.
- [14] Rob W. Brooker and Zaal Kikvidze, "Macaulay Land Use Research Institute", Craigiebuckler, Aberdeenshire AB15 8QH, UK; and 2 568 Environmental Building, The University of Tokyo, 5-1-5 Kashiwanoha, Kashiwa 277-8653, Japan, *Journal of Ecology*, 96, 703-708, 2008.
- [15] Shaaya E., Kostjukovski M., Eilberg J. and Sukprakarn C., "Plant oils as fumigants and contact insecticides for the control of stored-product insects", *Journal of Stored Products Research*, 33(1), 7-15, 1997. [https://DOI.org/10.1016/s0022-474x\(96\)00032-x](https://DOI.org/10.1016/s0022-474x(96)00032-x).