EFFICACY OF *SYZYGIUM AROMATICUM* (FLOWER) AND *PLECTRANTHUS AMBOINICUS* (LEAF) ON THE MANAGEMENT OF THE FRUIT FLY *DROSOPHILA MELANOGASTER* (DROSOPHILIDAE)

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Abstract

The selected plant leaves of P. amboinicus and S. aromaticum (clove) powdered and used for the treatment of Drosophila melanogaster. After days, exactly 10 number of D. melanogaster were introduced into each container along with addition P. amboinicus leaf powders and S. aromaticum (clove) powder in the concentration range of 1g, 2g up to 5g in each separate container. Regular observation was made at every 24 hours interval for 7 days on adult mortality of D. melanogaster. Present study was to investigate the properties of medicinal plant components, for their safety and efficacy. A synthetic insecticide is either not easily available to subsistence farmers or they cannot afford them, the use of natural medicinal plant leaves like S. aromaticum and P. amboinicus which can be easily grown by such farmers. Among the S. aromaticum, higher percentage of mortality rate of D. melanogaster was recorded in 5g.Among the P.amboinicus, higher percentage of mortality rate of D. melanogaster was recorded in 5g.But on a comparative analysis between the leaf powders and P.amboinicus , brought the higher mortality rate of D. melanogaster than S. aromaticum .The above results indicated that the leaf powders P. amboinicus of is very effective in controlling D. melanogaster Physico-chemical analysis and FTIR spectrum analysis of the two powders were also done. Therefore, the present study proves the possibility of using leaf and flower powders as insecticide to control the D. melanogaster. The present study also proved that presence of phytochemicals in two medicinal plant leaves and flower making difference in them. The data were subjected to Linear Multiple Regression analysis; means, standard deviation and correlation coefficient were analysed.

Keywords: *Drosophila Melanogaster, Plectranthus Amboinicus, Syzygium Aromaticum*

1. INTRODUCTION

In recent years, natural products have drawn the researchers' attention to find new solutions alternatives where the aims are to reduce the excessive use of synthetic pesticides. Among these alternatives in nature, products of plant origin are, in particular, more interesting because they are less toxic, biodegradable, and target-specific (Dua *et al*., 2010; Subramaniam *et al*., 2012). Recently, the plant extracts with insecticidal properties have continued to develop and some non- European countries have regulatory requirements for extracts and essential oils use (Isman, 2019). Plants are rich in bioactive secondary chemical metabolites and have proven their insecticidal activity by killing or repelling insects (Sukumar *et al*., 1991; Ghosh *et al*., 2012).

Medicinal plants are valuable resources for the majority of rural and urban populations in Africa and are the main means by which people treat themselves. Several species are known for their remarkable therapeutic properties. The study of traditional medicine and herbal treatment is therefore of particular interest because little research has been done on this aspect, and more particularly on the use of spontaneous species in traditional medicine.

2. MATERIALS AND METHODS

The study was carried out in off- laboratory conditions; to evaluate the efficacy of *P. amboinicus* (Leaf) and *S. aromaticum* (Flower) against the fruit fly, *Drosophila melanogaster* which infests the ripened banana. Collect the experimental insects *D. melanogaster* from the banana waste at home, it was stored in 5 containers.

Experimental Design

For the trial 1 experiment added 1gm - 5 gm of S. aromaticum powder in each container with some 25 Insects. Observed every day for the mortality of the insects up to 7 days. Repeated and the same for the trail 2 experiment also. Recorded the result. Same procedure was followed for trails of - P. amboinicus. Phytochemical analysis and FTIR analysis of the leaf powders were also analysed. All experiments were performed in two replicates and data were subjected to Mean, ±Standard Deviation, Correlation Coefficient and Regression estimation.

Table:1 – Plant Materials

Botanical Name	Common Name	Family Name
Plectranthus amboinicus	Karpuravalli	Lamiaceae
Syzygium aromaticum	Cloves	Myrtaceae

3. RESULT

The study was carried out in off- laboratory conditions; to evaluate the efficacy of *P. amboinicus* (Leaf) and *S. aromaticum* (Flower) against the fruit fly, *Drosophila melanogaster* which infests the ripened banana. The result analysis as follows:

In Linear Multiple Regression Model that two sets of variables have been selected, the total grams of pest control using *S. aromaticum* (Clove) Powder considered as a dependent variable and 1 to 5 grams have taken as an independent variable or exogenous variables. The basic objective of this model is to examine by β value and its efficacy of each gram of *S. aromaticum* (Clove) Powder. (**Table-2)**.

It is noted that there are no negative correlations between the variables. All the variables have not maintained a strong positive correlation between each other's. Especially, 4 gram and 5-gram pest control using *S. aromaticum* (Clove) Powder has perfectly positive high correlation of 0.90 units. Whereas, 1 gram and 2 gram of pest control has secured very low level of positive correlation recorded 0.40 units, i.e., both do not have much influence on pest control using *S. aromaticum* (Clove) powder**. (Table-2a)**.

It is noted that there are no negative correlations between the variables. All the variables have not maintained a strong positive correlation between each other's. Especially, 4 gram and 5-gram pest control using *S. aromaticum* (Clove) Powder has perfectly positive high correlation of 0.88 units. Whereas, 3 gram and 2 gram of pest control has secured very low level of positive correlation recorded 0.40 units, i.e., both do not have much influence on pest control using *S. aromaticum* (Clove). (**Table-3**).

The first trial of Linear Multiple Regression Model that two set of variables have been selected, the total grams of pest control using *P. amboinicus* (Karpuravalli) Powder considered as a dependent variable and 1 to 5 grams have taken as an independent variables or exogenous variables. The basic objective of this model is to examine by β value and its efficacy of each gram of *P. amboinicus (*Karpuravalli) Powder. (**Table-4**).

It is estimated that β5 i.e., 5 gram itself has more efficacy for pest control of *P. amboinicus* (Karpuravalli) Powder recorded 0.25 units. The least value of 0.17 indicates that if one unit pest control using *P. amboinicus* (Karpuravalli) Powder, other remaining constant, there should be 0.17 units mortality rate will be happened. R2 value indicates the suitability of the model where both dependent and independent variables are 0.97 per cent correlated each other's. (**Table-4a**).

The second trial of Linear Multiple Regression Model that two set of variables have been selected, the total grams of pest control using *P. amboinicus* (Karpuravalli) Powder considered as a dependent variable and 1 to 5 grams have taken as an independent variables or exogenous variables. The basic objective of this model is to examine by β value and its efficacy of each gram of *P. amboinicus* (Karpuravalli) Powder. (**Table-5a**).

It is noted that there is no negative correlations co-coefficients between the variables. All the variables have not maintained a strong positive correlation between each other. Especially, 1 with 5-gram pest control using *P. amboinicus* (Karpuravalli) Powder has perfectly positive high correlation of 0.95 units. Whereas, 3 and 2 grams of pest control has secured very

low level of positive correlation recorded 0.41 units, i.e., both do not have much influence on pest control using *P. amboinicus* (Karpuravalli) Powder. **Table-5a**).

Phytochemical Analysis

In the *Syzygium aromaticum* leaf powder, Carbohydrates, Saponins, Cardiac glycosides etc., are present. Glycosides, Lignin, Coumarins, Volatile oils Alkaloids, Flavonoid, Sterols, Terpenoids, Anthraquinone, Anthocyanin, Proteins, Phenolic compounds, Quinones, Tannin, Phytates are absent.

In the *P. amboinicus* Sterols, Quinones, Carbohydrates, Tannin, Saponins etc., are present Alkaloids, Flavonoid, Terpenoids, Anthraquinone, Anthocyanin, Proteins, Phenolic compounds, Phytates, Glycosides, Coumarins, Volatile oils are absent. (**Table-6**)

A) FTIR spectrum of leaf extract of *P. amboinicus*

P. amboinicus leaf extracts showed characteristic absorption band at 2931.80C≡C stretch Alkynes,1689.64 C=O stretch Carbonyls (general),1604.77N-H bend 1° amines,1512.19 N-O asymmetric stretch Nitro compounds,1450.47 C-H bend Alkanes ,1427.32 C-C stretch Aromatics 1319.31C-H rock Alknes,1265.30 C-N stretch Aromatic amines,1234.44 C-N stretch, Alphatic amines,910.40 O-H bend Carboxylic acid,817.82 N-H way 1",2" Amines, 694.37 C-H " oop " Aromatic,671.23 C-CI stretch Alkyl halides,516.92 C-Br stretch Alkyl halides. **(Table-7a).**

B) FTIR Spectrum of flower extract of *Syzygium aromaticum*

S. aromaticum flower extracts showed characteristic absorption band at 1604.77 N-H bend 1" Amines,1527.62 N-O asymmetric stretch Nitro compounds,1319.31 C-N stretch Alcohols, carboxylic acid, esters, ethers,1149.57 C-N stretch Aliphatic amines,694.37 N-H way 1",2" Amines,663.51 C-CI stretch Alkyl halides, 601.79 C-Br stretch Alkyl halides, 547.78 C-Br stretch Alkyl halides,516.92 C-Br stretch Alkyl halides. (**Table7b**).

4. TABLES

Table-2: Mean and Standard Deviation for First trial of the management of fruit fly *Drosophila melanogaster* using *Syzygium aromaticum* (Clove) Powder

Days	Mean of concentration	Std Deviation
Day 1	**0.40**	**0.69**
Day 2	**1.80**	**0.53**
Day 3	**0.93**	**0.89**
Day 4	**0.86**	**0.69**
Day 5	**0.80**	**0.98**
Day 6	**0.86**	**1.25**
Day 7	**1.00**	**2.14**

Source: Computed.

Table-2a: Correlation Co-efficient on First trial of the management of fruit fly *Drosophila melanogaste*r using *Syzygium aromaticum* (Clove) Powder

Variables	Total grams	1 gram	2 grams	3 grams	4 grams	5 grams
Total grams	1.00	.19	.23	.65	.82	.78
1 gram	.19	1.00	.14	19	.53	.50
2 grams	.23	.14	1.00	76	.33	.66
3 grams	.65	.19	.76	1.00	.63	.86
4 grams	.82	.50	.33	.63	1.00	.90
5 grams	.78	.50	.66	.86	.90	1.00

Source: Computed

Table-3: Mean and Standard Deviation for Second trial of the management of fruit fly *Drosophila melanogaster* using *Syzygium aromaticum* (Clove) Powder

Days	Mean of concentration	Std Deviation
Day 1	0.53	.69
Day 2	.93	.57
Day 3	1.06	.37
Day 4	1.00	.78
Day 5	1.00	.78
Day 6	1.06	1.01
Day 7	1.00	.78

Source: Computed

Table-3a: Correlation Co-efficient on second trial of the management of fruit fly *Drosophila melanogaster* using *Syzygium aromaticum* (Clove) Powder

Variables	Total grams	1 gram	2 grams	3 grams	4 grams	5 grams
Total grams	1.00	.83	.73	.43	.64	.86
1 gram	.83	1.00	.76	.36	.54	.80
2 grams	.73	.76	1.00	.32	.88	.87
3 grams	.43	.36	.32	1.00	.48	.67
4 grams	.64	.54	.88	.48	1.00	.88
5 grams	.86	.80	.87	.67	.88	1.00

Source: Computed

Table -4: Mean and Standard Deviation for First trial of the management of fruit fly *Drosophila melanogaster* using *Plectranthus amboinicus* (Karpuravalli) Powder

Days	Mean of concentration	Std Deviation
1 Day	0.33	.75
2 Day	0.73	.97
3 Day	0.93	0.78
4 Day	1.00	1.13
5 Day	1.06	1.11
6 Day	0.93	0.78
7 Day	1.13	1.02

Source: Computed.

Table-4a: Correlation Co-efficient on First trial of the management of fruit fly D*rosophila melanogaster* using *Plectranthus amboinicus* (Karpuravalli) Powder

Variables	Total grams	1 gram	2 grams	3 grams	4 grams	5 grams
Total grams	1.00	.19	.52	.41	.18	.60
1 gram	.19	1.00	.58	.64	.59	.82
2 grams	.52	.58	1.00	.98	.92	.75
3 grams	.41	.64	.98	1.00	.94	.74
4 grams	.48	.59	.92	.94	1.00	.76
5 grams	.60	.82	.75	.74	.76	1.00

Source: Computed.

Table-5: Mean and Standard Deviation for Second trial of the management of fruit fly *Drosophila melanogaster* using *Plectranthus amboinicus* (Karpuravalli) Powder

Days	Mean of concentration	Std Deviation
Day 1	0.60	.75
Day 2	0.86	.75
Day 3	1.00	.69
Day 4	1.13	.75
Day 5	1.00	.78
Day 6	1.00	.79
Day 7	1.26	.68

Source: Computed.

Table-5a: Correlation Co-efficient on Second trial of the management of fruit fly *Drosophila melanogaster* using *Plectranthus amboinicus* (Karpuravalli) Powder

Variables	Total grams	1 gram	2 grams	3 grams	4 grams	5 grams
Total grams	1.00	1.00	.86	.45	.80	.94
1 gram	1.00	1.00	.86	.45	.80	.95
2 grams	.86	.86	1.00	.41	.74	.88
3 grams	.45	.45	.41	1.00	.60	.67
4 grams	.80	.80	.74	.60	1.00	.90
5 grams	.94	.94	.88	.67	.90	1.00

Source: Computed.

Table-6: The Phytochemicals present in *Plectranthus amboinicus* and *Syzygium aromaticum*

Phytochemicals	*Plectranthus amboinicus*	*Syzygium aromaticum*
Alkaloids	-	-
Flavonoid	-	-
Sterols	+	-
Terpenoids	-	-
Anthraquinone	-	-
Anthocyanin	-	-
Proteins	-	-
Phenolic compounds	-	-
Quinones	+	-
Carbohydrates	+	+
Tannin	+	-
Saponins	+	+
Phytates	-	-
Cardiac glycosides	+	+
Glycosides	-	-
Lignin	+	-
Coumarins	-	-
Volatile oils	-	-

Table-7a: - FTIR Absorption frequencies (cm-1) of *Plectranthus amboinicus*

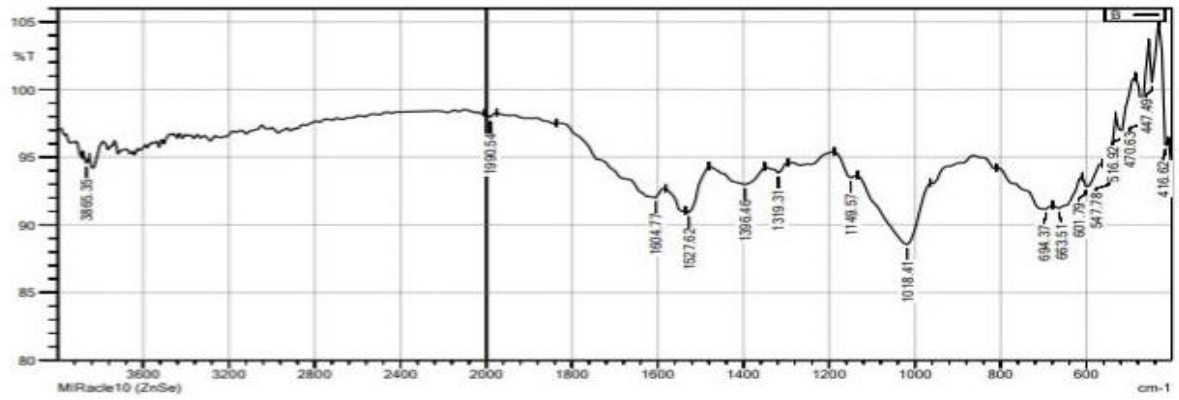
Frequency (cm^{-1})	Functional Groups	Phyto compounds
2931.80	C≡C stretch	Alkynes
1689.64	C=O stretch	Carbonyls (general)
1604.77	N-H bend	1° amines
1512.19	N-O asymmetric stretch	Nitro compounds
1450.47	C-H bend	Alkanes
1427.32	C-C stretch	Aromatics
1319.31	C-H rock	Alkenes
1265.30	C-N stretch	Aromatic amines
1234.44	C-N stretch	Alphatic amines
910.40	O-H bend	Carboxylic acid
817.82	N-H way	1",2" Amines
694.37	C-H " oop "	Aromatic
671.23	C-CI stretch	Alkyl halides
516.92	C-Br stretch	Alkyl halides

Table-7b: - FTIR Absorption frequencies (cm-1) of *Syzygium aromaticum*

Frequencies (cm-1)	Functional Groups	Phyto compounds
1604.77	N-H bend	1" Amines
1527.62	N-O asymmetric stretch	Nitro compounds
1319.31	C-N stretch	Alcohols, carboxylic acid, esters, ethers
1149.57	C-N stretch	Alphatic amines
694.37	N-H way	1",2" Amines
663.51	C-CI stretch	Alkyl halides
601.79	C-Br stretch	Alkyl halides
547.78	C-Br stretch	Alkyl halides
516.92	C-Br stretch	Alkyl halides

5. FIGURES

Figure: 7a- FTIR Spectrum of *Plectranthus amboinicus*



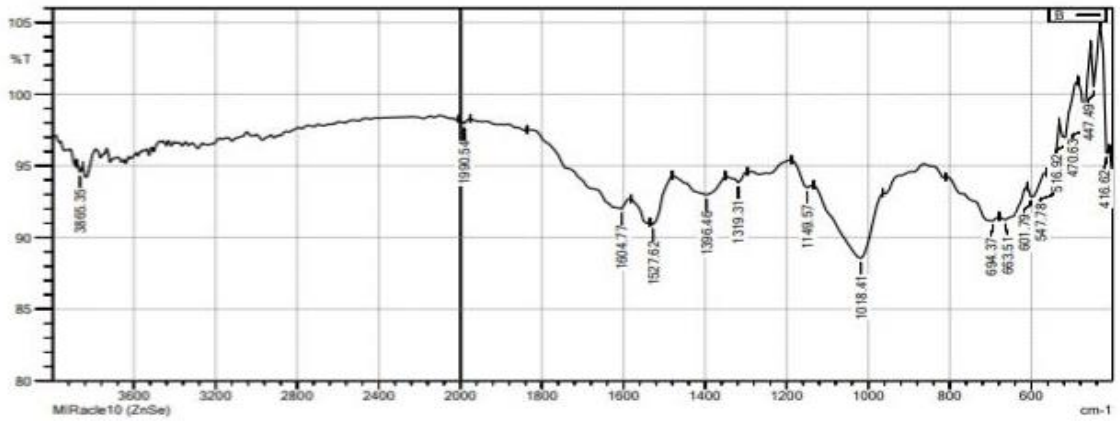


Figure: 7b- FTIR Spectrum of *Syzygium aromaticum*

6. DISCUSSION

Insect control is entering a new “botanical” phase that provides no-toxic molecules to no-target organisms, biodegradable, less likely to provoke resistance in target species, and appear one of means in better harmony with the environment (Philogene, 1991). Natural plant extracts contain a wide variety of secondary metabolites to which various biological and toxicological activities are attributed.

In India, about 7300 plant species are used in traditional health-care systems such as Ayurveda, Siddha, Unani, and folk healing practices. The blooming of traditional medicine industry results in an increasing demand on medicinal plant products. Medicinal plants 90% derived from natural habitats.

Rajgond Tribal of Haladkeri Village in Bidar district is far away from modern medicine even in the 21st century and is known for their unique way of life and disease management. Jawadhu hill’s in Tiruvannamalai district have a huge relation with their surrounding environment condition. The tribal community has not forgotten their age-old ethnicity and traditions. Medicinal plants Knowledge, which are used in their daily life against different ailments still lies with them. The variety flora of Jawadhu Hill’s includes, a large number of medicinal plants, are present.

In similar results showed Asteraceae family plants have a highly medicinal plant species present compared to Babungo family because of largely available biologically active compound present. Acatochaeta Africana has been found to contain phytochemicals which are capable of arresting wound bleeding, preventing the growth of wound contaminating microbes and accelerating wound healing. Most young people are not interested in traditional medical practice because it is less profitable compared to growing cash crops. Western Ghats is one of the plant biodiversity hotspots of India. Agumbe region of Western Ghats is known for rich plant diversity and traditional medicinal practices. Ten plants were identified to be used to treat fungal infections used exclusively against infectious diseases of both bacteria and fungi in general and skin infections, itching, wound dressing in particular.

7. CONCLUSION

Present study was to investigate the properties of medicinal plant components, for their safety and efficacy. A synthetic insecticide is either not easily available to subsistence farmers or they cannot afford them, the use of natural medicinal plant leaves like *S. aromaticum* and *P. amboinicus* which can be easily grown by such farmers. Among the *S. aromaticum*, higher percentage of mortality rate of *D. melanogaster* was recorded in 5g.Among the *P.amboinicus*, higher percentage of mortality rate of *D. melanogaster* was recorded in 5g.But on a comparative analysis between the leaf powders and *P.amboinicus* , brought the higher mortality rate of *D. melanogaster* than *S. aromaticum* .The above results indicated that the leaf powders *P. amboinicus* of is very effective in controlling *D. melanogaster* Physico-chemical analysis and FTIR spectrum analysis of the two powders were also done. Therefore, the present study proves the possibility of using leaf and flower powders as insecticide to control the *D. melanogaster.* The present study also proved that presence of phytochemicals in two medicinal plant leaves and flower making difference in them. The data were subjected to means, standard deviation and correlation coefficient were analysed.

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