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A RESEARCH PAPER ON FORMULATION OF INSECTICIDAL SPRAY FROM MALUS DOMESTICA SEEDS

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ABSTRACT

Malus domestica seeds, which contain bioactive chemicals with possible insecticidal capabilities, are used in this work to investigate the formulation of an insecticidal spray. A suitable solvent was used to extract the seeds, and emulsifiers and preservatives were added to the resulting extract to create a spray. The spray's potential as a natural pest control agent was shown by its insecticidal activity against the target pests. The formulation is a promising substitute for synthetic pesticides because it was refined for stability, efficacy, and safety. The entire potential of insecticidal sprays made from Malus domestica seeds need more investigation. The properties of insecticides formulations should be understood before choosing a right Insecticide which was help to avoid problems and it can be applied in an effective way.

KEYWORD : *Malus Domestica, Insecticidal Properties, Amygdalin,Cynide.*

INTRODUCTION

A] Introduction of plant

The scientific name for the apple tree in Latin is Malus domestica. Malus domestica is a deciduous tree found all over the world that is a member of the Rosaceae family(6).

Apples are the common name for Malus domestica. In several languages, it goes by different names. Sev (Hindi, Oriya), Apple (English), Safarjan (Gujarati), Tsoonth (Kashmiri), Sebu (Kannada), Safar Chad (Marathi), and Epal (Malayalam)(1).

Approximately 13 million acres are used for the commercial production of apples in 91 countries. Over the past ten years, apple output has grown by almost 17% worldwide. Globally, average yields are 10,000 pounds per acre (1).Temperature is one of the most important factors affecting Apple cultivation.

Apple seeds contain a compound called amygdalin, which is a cyanogenic glycoside. The amount Of cyanide released from apple seeds is generally very small, and consuming a small number of seeds is not Likely to cause harm in most individuals[2].

Apple juice is typically made from whole apples, including the seeds, even though people typically don't eat apple seeds. During juice manufacturing, apple seeds break down and contaminate the juice[6].

Malus domestica Seeds offer a potential natural alternative to synthetic pesticides.Malus domestica Seed-based insecticides could be used toProtect crops from insect damage.

The cyanide content in apple seeds can vary between different varieties of apples(2).
Malus domestica adaptable to various climates, but can be considered best adaptable to the cool temperate zone from about 35-50o latitude, deep, well drained, loamy soils with pH 6-7 are best(1).

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Plant

1]Leaves

Colour :- Darkgreen.

Size :- 5-12 cm long and 3-6cm broad.

Shape :- simple oval,arranged alternatively elliptical with serrate Margin with an acute tip.

2]Fruits

Size :Typically ranges from 5-9 cm in diameter.

Colour:- Different in colour, it depends on various species. The center of the fruit contains five carpels arranged in a five Point star, each carpels containing 1-3 seeds.

3]Flower

Colour : White in colour with pink tinge that gradually fades and Five petaled.

Size : 2.5-3.5 cm in diameter.

4] Seeds

Shape: Apple seeds are typically small,Oval-shaped, and pointed at one end,

Size: They are relatively small, usually Around 5-8 mm in length

Color: Apple seeds are often brown or Dark brown.

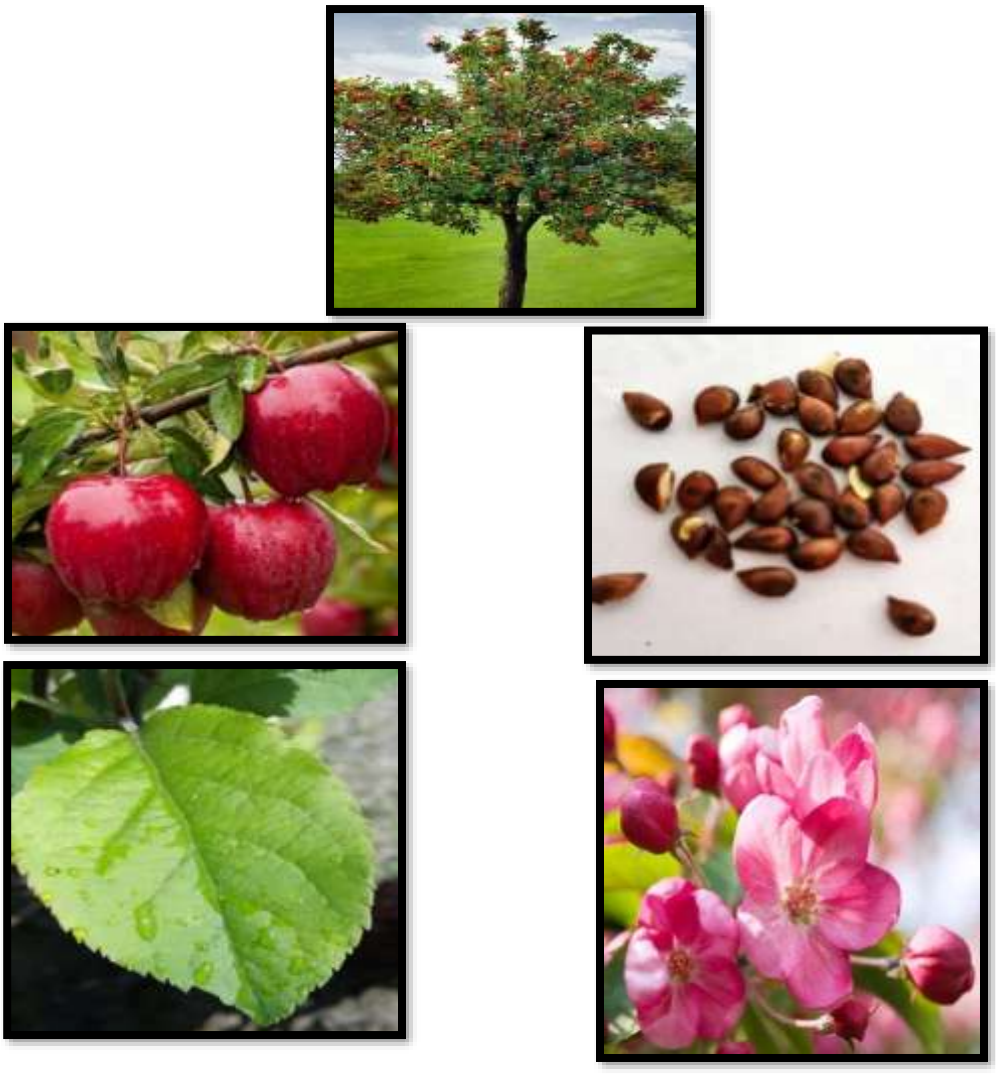


Figure 1. Diagram of Malus Domestica Plants.

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a] Whole plant
b]Fruits
c]Seeds
d]Leaf
e] Flower

Scientific classification

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Rosales
Family: Rosaceae
Subfamily : Maloideae or Spiraeoideae(5).

Chemical Composition

Flavonoids and other phytochemicals are abundant in apples, and their concentration can vary depending on a number of factors, including the apple's cultivar, how it is harvested and stored, and how it is processed.
Additionally, there are significant differences in phytochemical concentration between apple peels and apple flesh(1).Apple has been known as a beneficial fruit to its balanced nutritional composition(17).

Advantages and Disadvantages Of Insecticides

Advantages

The rapid breakdown of the active ingredient may be beneficial since it reduces the likelihood of residues in food. Before harvesting, several of these objects may be used. Some of these products have an immediate effect by stopping insects from feeding, even if they do not ultimately cause insect mortality.
The majority of these compounds do not pose a threat to plants. Resistance to these compounds does not develop as rapidly as it does to synthetic pesticides.

Disadvantages

Since many of these products only work as insect deterrents and have a gradual effect, they are not really pesticides. UV light quickly degrades them, resulting in a brief residual effect.They aren't always accessible throughout the year.
The majority of them lack known limits for residues. Their use is not being established by any legal registrations. Not all of the advice that growers heed has been validated by science(16).

Mechanism of action of Insecticides

To defend themselves against infections and herbivores, plants create a variety of bioactive substances. Natural pesticides can be made from these substances by extracting them from the plant. Plant extracts frequently contain fatty acids, alkaloids, terpenoids, phenols, and quercetin, among other bioactive substances.

Fatty acid salt kills small insects and mites through suffocation i.e. by blocking the spiracles or disruption of waxes present in cuticles and membranes in the integument and hence leads to desiccation(16).

Alkaloids, a group of naturally occurring nitrogenous compounds present in plants with a wide range of biological activities, are a common source of insecticides.

Medicinal properties of Malus Domestica.

1.Antimicrobial activity of insecticidal spray

The fruit of M. domestica was found to have the strongest effects on gram-positive and gram-negative bacteria, including B. subtilis, S. aureus, E. coli, and P. auroginosa, respectively, when extracted with water and alcohol (1).

2.Antioxidant activity:-

It has been discovered that apples, and particularly their peels, have strong antioxidant properties and can significantly slow the growth of colon and liver cancer cells. The antioxidant activity of 100 g of apples is equal to roughly 1500 mg of vitamin C, as the overall antioxidant activity of apples with the peel was about 83 umol vitamin-C equivalents. Nevertheless, only roughly 5.7 mg of vitamin C

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are present in 100 g of apples. Although vitamin C is a potent antioxidant, this study demonstrates that a number of other molecules account for almost all of apples' antioxidant activity. Apples' vitamin C content was less than 4% of their total antioxidant activity.

3.Anti-Inflammatory

Effect of anti-inflammatory action of apple polyphenol extracts prevents damage to human gastric epithelial cells in vitro and to rat gastric mucosa in vivo. It was concluded that apple extract reduces gastric erosion in indomethacin(at dose of 35 mg/kg, s.c) induced injury in rats because of Phenolic compounds have been shown to exert direct antioxidant effects acting as ROS scavengers, hydrogen donating compounds, singlet oxygen quenchers, and metal ion chelators.

4.Anticancer

Most recent instances recorded globally in 2018, colorectal cancer (CRC) ranks as the fourth most common malignancy. Apples also contain anthocyanins, particularly sianidin-3-O-galactoside (Cy3Gal), in addition to flavonoids. According to research, mice given apples WF and RF had the lowest incidence of ACF in ST (eight weeks after receiving an AOM injection).However, only meal supplementation with apple WF was able to achieve the ACF inhibition of 41.3% in the LT (14 weeks following AOM injection), as a result of increased daily intake of flavan-3-ols and flavonols(15).

B| Introduction of Insecticidal

Insects have always been man's most serious enemy, even from the prehistorical days(14).
Insecticides are chemicals used to kill insects, which have a Wide application in medicine, agriculture, and industry(5). Insecticides are formulated by mixing active ingredients with inert ingredients to make a compatible combination that is effective and safe for use(9).
Study of insects is known as entomology. Insecticidal is used to kill insects.

Insecticide to be effectively Used in the control of insects. It must first be Prepared into a form suitable for a particular Application method(10).

Cyanide is one of the most rapidly acting Poisons. Apple seeds contain a compound called Amygdalin ,which is release cyanide when amygdalin is ingested, it is broken down by enzymes in the gut to release cyanide.

Inhalation or ingestion of cyanide produces reactions within a few seconds and Death within minutes(12).
Cyanide inhibits the transfer of electrons to Oxygen, preventing the production of ATP(adenosine triphosphate) and leading to Cellular energy depletion.

Cyanide poisoning Can cause respiratory failure due to the Inhibition of cellular respiration in the Lungs.
When amygdalin comes Into contact with water or digestive enzymes, it breaks down to release hydrogen cyanide. However, the amount Of cyanide released from apple seeds is generally very small, and consuming a small number of seeds is not Likely to cause harm in most individuals(2).

Microbials such as bacteria, fungi, or viruses are applied ontoCrops and either have a direct impact on the target pest or Stimulate the endogenous defense system of plants to protect themselves against the pests and diseases(13).
In the Spray Water is available, liquid formulations are economical,Efficient and convenient to apply(14).

Properties of insecticidal spray

1) Toxicity:- The spray is Toxicity to insects due to presence of cynide.
2) Stability :- The spray is stable at room temperature .
3) Viscosity :- The spray has a suitable Viscosity for easy applications.

Applications

1) Aphids:- Small,soft bodies insects that feed on plants sap.
2) Whitfield:- Small,winged insects that feed on plant sap.
3) Caterpillars:- Large ,lepidopteran larvae that feed on plants leaves & Stems.

Safety precaution during Handling

1)Wearing protective gear :- Gloves ,goggles & face mask should be worn when Handling spray .
2)Avoiding skin :- The spray should not come in contact with skin,as it can cause irritation.

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3)Avoiding inhalation:-Spray should not be inhaled ,as it can cause respiratory problems.

Material & Method for Preparation of insecticidal spray.

The raw materials used, formulation, were taken from their respective fruit (Malus domestica fruit).All raw materials were Cleaned,dried properly and evaluated for foreign matter.

Pharmacognostic evaluation of crude drugs

The studies of sensory characters provide the simplest andQuickest means by which identity, Purity and quality can be measured. If a sample is found to be significantly different in terms of colour, consistency, odour, it not is considered as not fulfilling the requirements(5).

Process of Formulation.

1) Collection of seeds & preparations.
2) Extraction (By Maceration process)
   - Choose suitables solvent (Ethanol,methanol or distilled water)
   - Perform extraction by maceration process.
3) Formulation
4) Mix the concentrated extract with
   -Preservative , Solvent , stabilizer, surfactant.
5) Adjust the PH.

Extraction (By Maceration process).

The seed samples were collected and washed carefully with Water to remove dust and foreign materials.Then the washed Seeds were dried For few days.

After drying the seed samples were Convert into a powder form using a mortar & pestle.

The dry seed powder samples were extracted with Methanol solvent for 3 days Until complete extraction. After extraction, the sample was Filtered with filter paper, (Whatmann No. 1)(5).

Ingredients used for Formulation .

1)Solvent:

Ethanol is used as solvent for the formulation of insecticidal spray from Malus domestica seeds. Malus domestica seeds are used to extract insecticidal chemicals using ethanol.Ethanol can Effectively extract a wide range of Bioactive compounds. Ethanol is used to soak Malus domestica seeds in order to extract the necessary components.

2)Surfactant

Sodium lauryl sulfate is used as surfactant in formulation of insecticidal spray from Malus domestica seeds. Sodium lauryl surfate can enhance the solubility & dispersion of lipophilic compounds. Sodium lauryl sulfate can inhaled the bioavailability & efficacy in insecticidal compounds.

3)Preservative

Potassium sorbate is used as preservative in the formulation of insecticidal spray from Malus domestica seeds. Potassium sorbate can show the antimicrobial properties it can help to prevent microbial growth & contamination in formulation. In can also extend the shelf life of insecticidal spray. It can Prevent the growth of bacteria,yeast and mold.

Prevent microbial growth & it can help to maintain efficacy of insecticidal spray.

4) Stabilizer or Humactant

Glycerin can help to Stabilize the formulation, reducing the risk of separation & preparations.Glycerin can help retain Moisture in the formulation, improving its Stability and efficacy.

Components	Ingredients
API	Malus domestica seeds Extact
Solvent	Ethanol/Methanol
Surfactant	Sodium lauryl sulfate
Preservative	Potassium sorbate
Stabilizer/Humactant	Glycerin
PH Adjuster	Buffer

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Table no. 1

Formulation process:-



Source of Material.

Extraction



Bio-efficacy Against Bacteria & Insects.

Applications of Spray

Formulation

Figure No. Formulation Process od insecticidal spray.

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Evaluation test for Insecticidal spray

1) **Organoleptic tests**

Colour	Pale yellow
Texture	Liquid
Appearance	Pale yellow liquid solution.

2) **PH Determination**

Verify the PH of the formulation is between 5.5 to 7.4

Standard PH	Observed PH	Nature
5.5 to 7.5	5	Acidic

3) **Stability Test**

Assess the formulation's Stability under various condition.

Ex. Temperature, Light.

Stability Test	Procedure	Result
Sunlight	Sample store under sunlight for 2 days.	No changes.
Temperature	1.Sample store under 4°C. 2.Sample store at room temperature.	1.No changes. 2.No changes.

4) **Insecticidal Activity Test**

Evaluation of formulation's efficacy against target pests.

CONCLUSION

Plant extracts have the potential to be a useful alternative to synthetic pesticides for controlling insects and diseases.They are considered to be safer for human health and the environment compared to synthetic insects, but their efficacy and stability can be limited.The extracted apple phenolics could be beneficial for various food product developments to improve their functional properties. Malus domestica seeds exhibit insecticidal properties. Malus domestica seeds potential benefits are approach may offer a more environmentally friendly alternative to synthetic insecticidal.

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