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RESEARCH ARTICLE
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PPHARMACOGNOSTIC STUDIES OF ELAEAGNUS ANGUSTIFOLIA L. FROM BOI, DISTRICT ABBOTTABAD

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Abstract

Elaeagnus and *Elaeagnus angustifolia L*. are thought to be the most ancient genera in the *Elaeagnaceae* family. There are perhaps 50–70 species in these families. The microscopic characteristics of the leaves and stems include their size, fracture, odor, size, and flavor. Microscopical analysis reveals vascular bundles, the top and lower leaf surfaces, trichomes, parenchyma, and sclerenchyma cells, as well as the stomatal index. Methanolic, ethanolic, and distilled water extracts of both parts were also studied for their phytochemical properties. The results of phytochemical analysis showed that secondary metabolites, such as sugars, oils, phenols, and alkaloids, among others, exist. The goal of the current study was to evaluate this plant's anti-bacterial, anti-fungal, and antioxidant properties. The anti-bacterial activity was examined using several bacterial strains. Plant shown strong resistance against bacterial strains. The highest zone of inhibition for the bacterial strain *Salmonella typhi* was seen in the leaf and leaf extract (22mm) and in the stem (21mm). In addition, plants demonstrated potent anti-fungal efficacy against diverse fungi strains. The fungal strain *Mycosphaerella citri*, which is measured at 15mm in the stem methanolic extract and 17mm in the leaves, has the biggest estimated zone of inhibition. Through DPPH, the antioxidant capacity of plants was also examined. *Elaeagnus angustifolia L*. demonstrated plants' high antioxidant capability. On plants, cytotoxic and phytotoxic activities were carried out as well. Lemna Minor L. was utilized against the research plant to examine any potential phytotoxic effects. Results indicated that the plant has a high level of phytotoxicity, therefore it will likely be employed as a weedicide going forward. Using brine shrimps (BSLA), cytotoxic activity was also performed on plants; the leaves and stem of the plants displayed cytotoxic effects.

Keywords: Anti-microbial activity; Bioassay; Culture media; *Elaeagnus angustifolia L.*; MDR microbial strains; Nano particles; Pharmacognosy.

INTRODUCTION

J.A. Schmidt coined the phrase "pharmacognosy" for the first time in 1811. The word "pharmacognosy" is derived from the Greek words "pharmakon" and "gnosis," which both imply "knowledge." The study of dried pharmacological components derived from animal and microbial sources is known as pharmacognosy, and it is crucial for the development of novel medications as well as for medical diagnosis and therapy [1]. The plants that are utilized in both traditional and contemporary medicine to sustain human health. Islam also reveals some subtle truths on the use of many medicinal plants to heal certain ailments. In Islam, Hazrat Adam (A.S) is credited with beginning the practice of using medicinal plants, while Hazrat Muhammad (S.A.W.) is credited with ending it. However, the worldwide search for and organization of these medicines has continued since the passing of Hazrat Muhammad (S.A.W.) [2]. 80% of the people in North Pakistan rely on medicinal herbs, which are traditionally used to treat a wide range of illnesses. Some drugs are produced in Pakistan using a variety of plant-excretory products, including latex resins, etc. The World Health Organization (WHO) asserts that the best source for discovering new pharmaceuticals is medicinal plants [3]. The practice of prescribing a set of standards or intrinsic properties, consistent parameters, and unambiguous qualitative and quantitative values for herbal medications carries an assurance of quality, efficacy, safety, and repeatability. Because it improves the total quality of therapeutic treatment, standardization is outstanding [4]. For the purpose of identifying drugs, both macroscopic and microscopic properties are necessary. Herbs are recognized by their microscopic characteristics. The drug's macroscopy includes characteristics peculiar to plants, such stomata and trichomes, as well as taste, odor, color, size, and shape. Additionally, chemical tests are run to examine some microscopic properties. Polymerase chain reaction (PCR) is occasionally used to identify plants [5]. Plant phylogenetic traits and epidermal structure of plants, such stomata and stomatal morphology, are also very important in identifying particular species of plants. Positive actions can be significantly influenced by the use of phytochemicals and a wide range of components from plant extracts, many of which have antibacterial characteristics [6]. Plants are more beneficial since they contain phytochemicals. Proteins, sugar, and chlorophyll are examples of fundamental phytochemical substances. Terpenoids, alkaloids, and phenolic compounds are examples of secondary phytochemical components. Plant phytochemical analysis is crucial for the development of novel pharmaceuticals in the field of pharmacy [7]. Biochemical processes are crucial in the development of novel medications. The effective dosage of a medicine is determined using these methods. The best resource for identifying plants is anatomy. It covers the key characteristics needed to confirm or identify any plant species [7]. The interior structure and tissues are connected to anatomy. Free radical-induced oxidative cell damage is a contributing factor in many illnesses. Therefore, it is crucial for humans to consume naturally produced antioxidants. These kinds of substances are widely distributed in both culinary and medicinal plants. The examination of natural sources with improved features for the search of herbicides is aided by the phytotoxic activity [8]. In the family Elaeagnaceae, the genus Elaeagnus silver berry, sometimes known as oleeaster, has 50 to 70 species of flowering plants. This family's species are found in Asia's tropical and subtropical regions. The species that make up the *Elaeagnus triflora, E. commutate, E. philippinesis,* and *E. angustifolia* family. Three genera make up this family. There are reports of two genera and four species from Pakistan (Asia) [9]. Boi is situated in the Abbottabad district's northwest. It is close to Murree, Balakot, and Kashmir. Boi is short for "Fragrance of Roses." Its coordinates are 34°18′N 73°26′E, and its average elevation above sea level is 2801 feet. There are about 18000 people living in BOI overall [10]. A genus of tasty and beautiful evergreen plants with dense shrubs or tiny trees is called *Elaeagnus*. The stems and opposite leaves of the plants are covered in tiny silvery to brownish scales, giving them a white to grey-brown hue. Flowers are small, without petals, and have a calyx with four lobes [11]. On the genus *Elaeagnus*, anti-oxidant and permaculture activities are also carried out. The leaves of *Elaeagnus angustifolia L*. are used to cure asthma. Fruit can be eaten. In addition to being utilized as fuel, stems and leaves are

also used as animal feed. A plant can be used as herbal remedy [12]. The main aims of the study were to analyze phytochemical investigation of various *Elaeagnus angustifolia L* parts and to investigate morpho-anatomical studies and biological assays of the different parts of the plant. Additional objectives included evaluating morphological parameters of crude drug and studying histological characteristics of powder drug.

MATERIAL AND METHOD

Plant specimen collection and their study

Elaeagnus angustifolia L. was gathered as a plant specimen in June 2020 from the BOI district of Abbottabad, and its identity was confirmed or further examined with the use of the Flora of Pakistan website. In order to confirm the plant specimen, this plant was compared to others that were previously kept at the herbarium of the Hazara University in Mansehra. Different plant components, such as leaves and shoots (stems), were preserved in formalin, acetic acid, and alcohol (FAA) for internal analysis (anatomical research).

Powder drug preparation of the plant

The tap water was used to wash the plant in order to eliminate contaminants. The plant sections were separated after being washed, placed in the shade, and dried for a few days. The pieces were powdered using an electric grinder after drying. After that, the powder was kept in a plastic container for future research [13].

Plant morphology

The preserved plant specimen was examined morphologically using several methods, including the color, length, surface, etc. of the leaves and stem [14].

Microscopic investigation

The dried components of the plant were ground into a fine powder and stored in vials for microscopic features research. The little quantity of powdered leaves and stem was boiled in 70% chloral hydrate using two separate test tubes. The chemical was burned briefly on a spirit lamp, and then left for around 30 minutes. After being put onto a plan glass slide, the material was colored with safranin (1%), to which a drop of glycerin jelly had been added. It was then covered with a heated cover slip, which created air bubbles that were later sealed with nail enamel. Investigations into the many plant tissues and cells contained in the powdered medicine were extensive [13].

Epidermal anatomy

In order to study the architecture of the epidermis, leaves were first subjected to a 3- to 4-day formalin-acetic acid alcohol treatment (90% ethanol, 5% formalin, and 5% acetic acid), followed by a 70% ethanol wash. 4-5 pieces of leaves were cut using a free hand microtome. A tiny test tube was filled with potassium hydroxide. The upper and lower portions of the plant were taken for microscopic examination after heating. Analysis, both qualitative and quantitative, follows [15].

Qualitative and quantitative investigation

Under a microscope, qualitative investigations were carried out to screen various cell types or phytochemical components, such as epidermal cells, guard cells, and the presence or absence of oil drops, while quantitative investigations counted the number of stomata. This inquiry looked at size, length, quantity, and breadth. For instance, the quantity of stomata, the size of an epidermal cell, etc [16].

Leaves and stem anatomy

The transverse section of leaves and stems and their parts were cut in to small thin pieces using sharp blade (microtome) for anatomical studies [17].

Microscopic investigation of the plant

The components of the plant were thinly sliced using a microtome for microscopic analysis in order to represent anatomical features. The thin slice was placed on the slide and stained for two minutes with Safranin 1%. Green reagent was then used to make the slide more transparent after Safranin. Both xylol and acetic acid were employed to quickly remove excess stain and color from the slide. Sections were treated with glycerin to make cells and tissues more visible. The stain slides were enclosed in a cover slip, and they were fixed with nail enamel. The permanent slide was mounted and examined under a microscope [18].

Qualitative phytochemical investigation and plant extract preparation

Three solvents methanol, ethanol, and distilled water were utilized to prepare the extract for the phytochemical assay. 100 mL of solvent was used to soak 10 grams of powder. By vigorously shaking them every day for at least 60 minutes, these mixes were preserved for 7 days. Through the use of filter paper, the extract was filtered, and these samples were employed for additional phytochemical research [19].

Phytochemical Screening

Different investigation i.e. Anthraquinones test, Oil test, Tannins, Saponins, Flavonoids, Alkaloid, Quinones, Glycoside, Cardiac Glycosides, Phenols, Coumarins, Paleobotanies and carbohydrates investigation was done for the phytochemical Screening of the plants. By modifying a conventional methodology, the assessment of active secondary metabolites was done on the aerial sections of the research plant [20].

Determination of antibacterial activity of *Elaeagnus angustifolia L.* plant

To find antibacterial activity the bacterial lawn were made on Muller Hinton media. Antibacterial qualities of six different kinds of bacteria were evaluated, namely Gram-negative like *Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia* and *S. typhi* as well as Gram-positive bacteria like *Staphylococcus aureus* and *Listeria monocytogenes*. The wells were created using sterilized borer on the media. Two wells contained plant extracts, a third had antibiotics (ciprofloxacin), and a fourth contained DMSO. The zone of inhibition on these plates was then examined after a 24-hour incubation period [21].

Determination of antifungal activity of *Elaeagnus angustifolia L.* plant

To determine the antifungal activity the agar well diffusion technique was used. Three different species of fungi like *Penicillium, M. citri* and *Rhizopus stolonifer* was streaked and lawn was made on to the SDA media. The wells were created using sterilized borer on the media. Plant extracts were divided into two wells, antifungal drugs (Terbinafine) were put into a third well, and DMSO was put into the fourth well. These plates were then incubated for 24 hours to check the zone of inhibition [21].

Phytotoxic activity

Lemna Minor L. stem and leaf extract was utilized to examine the phytotoxic effects. The extract was created using ethyl alcohol. Petri dishes were collected in accordance with the needs. There were created concentrations of 10, 100, and 1000 liters. Each petri plate included 10 roots of Lemna Minor L. plants. The process was modified, and various concentrations of plant extract from the stem and leaves were obtained. In each petri dish, frond formations could be detected. The dishes were abandoned for a week. After a week, the number of fronds was counted and noted [22].

Cytotoxic activity

Brine shrimp eggs were utilized to test for cytotoxic action. The shrimp egg has to be in contact with sea water in order to hatch. For the purpose of making sea water, 1000 ml of distilled water was combined with 38 grams of sea salt. Then eggs were put to the sea water that had been preserved in

the plastic container. Following that, the container spent 24 hours in a cytotoxic chamber. The egg matured into an adult larva after 24 hours. 10 brine shrimp were placed in test tubes along with 4 mL of distilled water. The tubes stayed beneath the bulb. After 24 hours, a number of shrimp deaths were noted [23].

Antioxidant activity

In a research on antioxidants, 25 mg of plant extract was diluted in 50 ml of water, and the resulting solution was subsequently diluted to four different microgram concentrations. This concentration was created by straightforward dilution. Then, 5ml of each extract and 0.001M of DPPH were added to a different test tube. More than 40 minutes of darkness were required for better results. Both samples were examined at 735 nm, which was the UV value selected on the spectrophotometer [24].

RESULT

Morphological features of *Elaeagnus angustifolia L*

Elaeagnus angustifolia L. morphology was studied by looking at the leaves' color, arrangement, size, shape, margins, and venation (figure: 1). The complete fruit and flower features as well as the leaves' oblong form, silver color, pinnate venation, and edge were investigated (table: 1).

Table 1: Morphological characters of *Elaeagnus angustifolia L*

S. No.	Characters	Observation
1.	Leaf type	Deciduous
2.	Fruit length	1 cm
3.	Leaf arrangements	Alternate
4.	Leaf color	Silver
5.	Type	Simple
6.	Fruit color	Yellow
7.	Flower character	Not showy
7.	Venation	Oblong
8.	Margin	Entire
9.	Leaf size 2 to 4	Inches
10.	Flower color	White
11.	Fall color	No color

Figure 1: The morphological characteristics of *Elaeagnus angustifolia L.* Plant

Pharmacogenetic studies

Macroscopical and organoleptic characters

Organoleptic examination was employed to document the macroscopical qualities of the stem of *Elaeagnus angustifolia L.*, whereas organoleptic inquiry was used to record macroscopical fractures of the plant's leaves (Table: 2 and figure: 2).

Table 2: Macroscopical and organoleptic characteristics of Leaves of *Elaeagnus angustifolia L*.

S. No.	Features	Macroscopic Observation of Leaves	Organoleptic Observation of Stems
1	Color	Light green	Light brown
2	Odor	Pleasant	Pleasant
3	Texture	Rigid	Rigid
4	Taste	Better	Tasteless

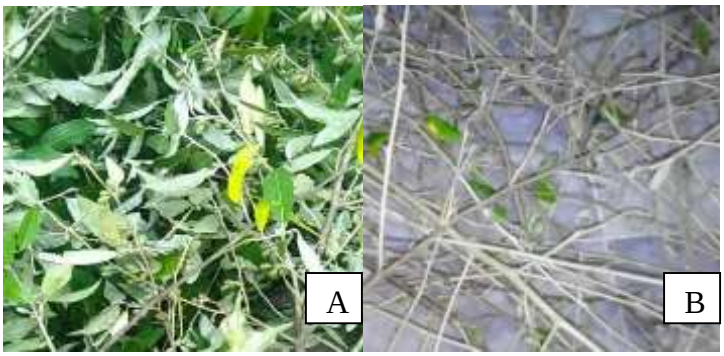

Figure 2: Organoleptic and macroscopic features of *Elaeagnus angustifolia L* Plant: (A) Leaves (B) Stems

Microscopical characteristics of leaves

Under a 10x lens magnifying microscope, epidermal cells, parenchymatous cells, and schalarchyamatous cells were shown to exist (figure: 3). All cells were recorded using micrometers (table: 3).

Table 3: Microscopical study of leaf powder drug

S. No.	Types of cells	Length (µm)	Width (µm)
1	schalarchyamatous cells	150 µm	25 µm
2	Trichome	70 µm	30 µm
3	ParenchyAmatous cells	80 µm	30 µm

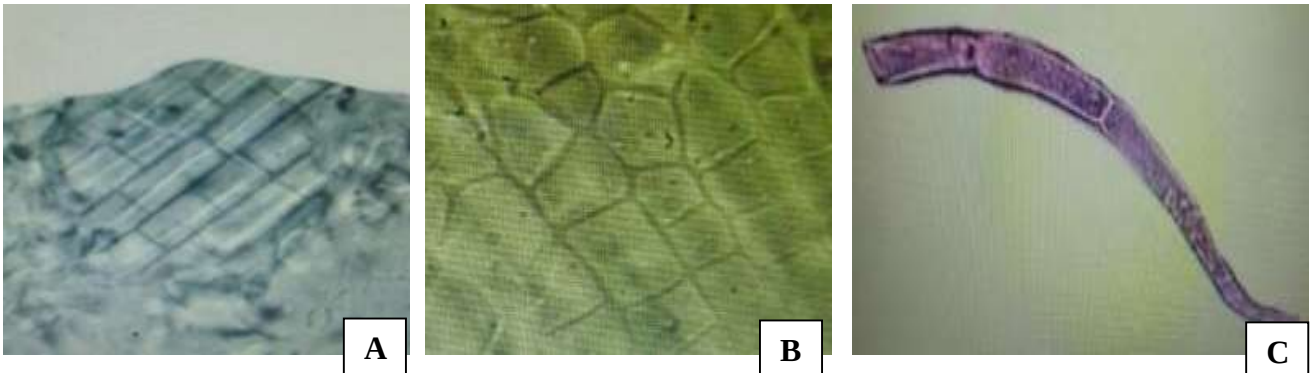

Figure 3: Microscopic anatomy of leaves powder drug: (A) schalarchyamatous cell (B) ParenchyAmatous cells (C) Trichome

Microscopic characters of stem

Using a microscope with a 10x lens, the microscopical properties of powder stem drug were examined. Trichomes, spiral tracheids, and reticulate tracheids were among the cells that were found (figure: 4). After taking measurements, microscopy under a microscope was used, along with photos (Table: 4).

Table 4: Microscopical studies of stem Powder drug

S. No.	Cells types	Length(µm)	Width (µm)
1	Fibers	150µm	25µm
2	Epidermal Cells	90µm	30µm
3	Reticulate tracheid's	125µm	75µm
4	Spiral tracheid's	70µm	60µm

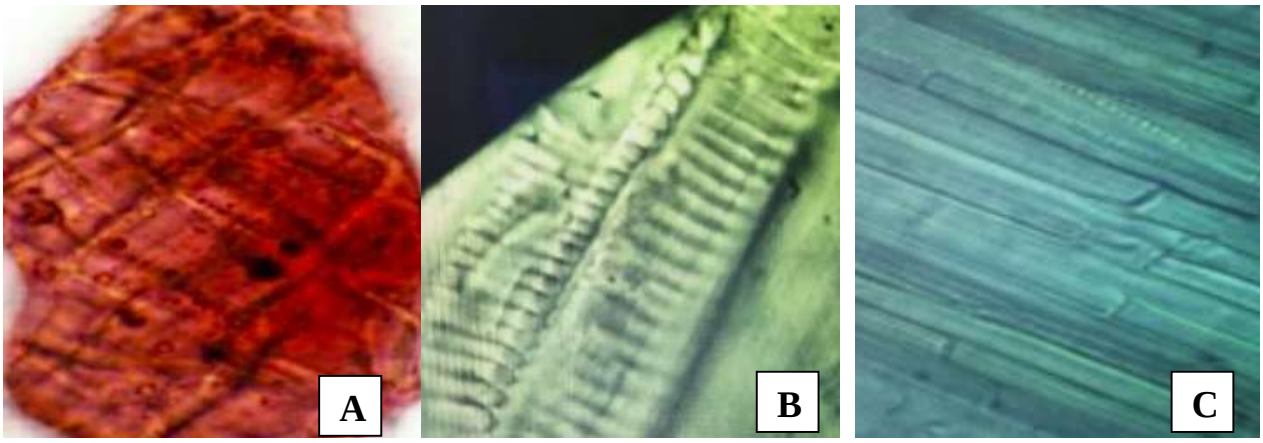

Figure 4: Microscopic character of stem cell and stem powder anatomy: (A) epidermal cell (B) Reticulate tracheid (C) Spiral tracheid

Section cutting leaves and stems of *Elaeagnus angustifolia L.*

A leaf segment was examined with a microscope's 10x eye piece. Following the transverse section of stem, which revealed the epidermis, cortex, pith, xylem, and phloem under the 10x lens microscope eye piece, various structures were studied. These structures included epidermis, palisade layers, collenchyma, and xylem and phloem.

Epidermal anatomy and qualitative character of *Elaeagnus angustifolia L*

Elaeagnus angustifolia L. leaves' upper and bottom surfaces were examined. *Elaeagnus angustifolia L.* has two layers of epidermal cells in its structure. The cells are shaped like hexagons. Guard cells in the shape of beans are present in the anomocytic type of stomata. A group of secondary cells surrounds the guard cells (table: 5).

Table 5: Qualitative features of *Elaeagnus angustifolia L.*

S. No.	Qualitative character	Observations
1	Guard Cells	Bean shaped
2	Epidermal cells	Hexagonal
3	Oil droplets	Present
4	Stoma type	Anomocytic
5	Single /double layered	Double

Quantitative character of *Elaeagnus angustifolia L*

Use a 10x lens on a microscope to examine the leaves of *Elaeagnus angustifolia L*. According to the investigation, epidermal cells are about double-layered in plants. Different cells' lengths and widths were recorded like stomata, spiral tracheids, and epidermal cells (table :6).

Table 6: Quantitative characters of *Elaeagnus angustifolia L*

S. No.	Quantitative characters	Observations
1	Thickness of stoma	40μm
2	Total stomata in area	4-5
3	Size of epidermal cells	70μ
4	Quantity of EP cells in region	16-18

Stomatal index

In the leaf, 21 epidermal cells and 15 stomata were being examined. Stomatal index (SI) was calculated as S, and it was 121.

Phytochemical Screening on Leaves and Stem of *Elaeagnus angustifolia L.*

Elaeagnus angustifolia L. plant extracts were used in the phytochemical analysis. Different phytochemicals are produced as a result of using distilled water, ethanol, and methanol (Table: 7). Paleobotanies, saponin, tannins, cardiac glycosides, and coumarins were not present in ethanolic, methanolic, or distilled water, according to phytochemical testing. There were also phenols, quinones, flavonoids, and terpenoids. Alkaloids were identified in the ethanolic extract of the leaves, but only methanolic extract of the leaves included carbs, whereas all extracts of the stem of *Elaeagnus angustifolia L*. contained carbohydrates.

Table 7: Phytochemical analysis of powder drug of stem and leaves

S. No.	Phytochemical test	Ethanol		Methanol		Distilled water	
		Stems	Leaves	Stems	Leaves	Stems	Leaves
1	Phenols	+	+	+	-	-	-
2	Anthraquinones	-	-	-	-	-	-
3	Terpenoids	+	+	+	+	-	-
4	Tannins	-	-	-	-	-	-
5	Saponins	-	-	-	-	-	-
6	Fixed oil	+	+	+	+	+	+
7	Coumarins	-	-	-	-	-	-
8	Paleobotanies	-	-	-	-	-	-
9	Carbohydrates	+	+	+	+	+	+
10	Cardiac Glycosides	+	+	+	+	-	-
11	Glycosides	+	-	-	-	-	-
12	Quinones	-	+	-	+	-	-
13	Flavonoids		+	+	+	+	+
14	Alkaloids	+	+	+	+	+	+

Key: (+) present (–) absent

Cytotoxic activity of *Elaeagnus angustifolia L*. Leaves and Stem

The data relating to cytotoxic action of *Elaeagnus angustifolia L*. are reported in (Table: 8) The 1000 ppm concentration of the stem and leaf extract, which exhibited 96% mortality, had a significant impact on brine shrimp survival, according to the results. Similar to the stem and leaf extract, the Brine shrimps displayed substantial impacts with fatality percentages of 86 and 80, respectively, at 500ppm and 100ppm, respectively. It was discovered that the effects of stem and leaf extracts were not very comparable.

Table 8: Cytotoxic activity of *Elaeagnus angustifolia L.* Stem and Leaves

Plant extract	Concentration (ppm)	Total no. of shrimp	No. of shrimps survived (Mean±SD)	No. of shrimp dead (Mean±SD)	%age lethality
Stems	100	10	1.33±0.05	8.67±0.05	86%
	500	10	1.33±0.05	8.67±0.05	86%
	1000	10	0.33±0.02	9.67±0.05	96%
Leaves	100	10	1.33±0.05	8±0.05	80%
	500	10	2±0.05	8.67±0.05	86%
	1000	10	0.33±0.02	9.67±0.05	96%

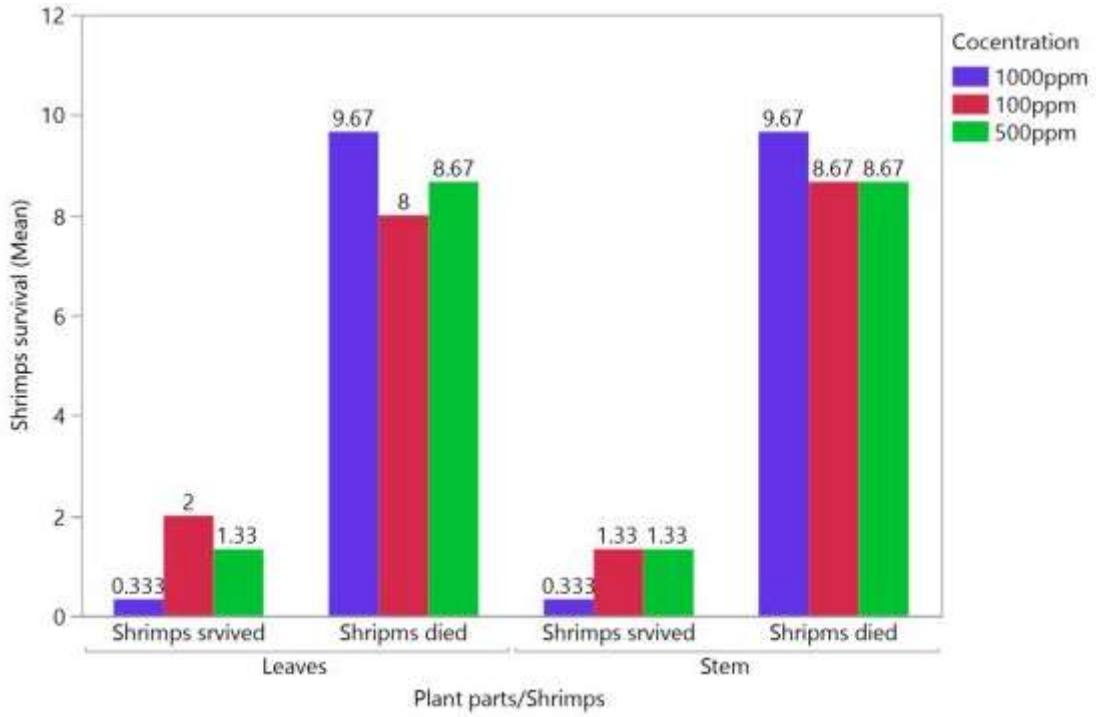

Figure 5: Graphical representation of cytotoxic activity of *Elaeagnus angustifolia L.*

Antibacterial activity of *Elaeagnus angustifolia L.* Leaves and Stem

According to the result of antibacterial activity the *Elaeagnus angustifolia L.* leaves was higher (24+1, MeanSD) against *S. typhi* and lower (against *K. pneumoniae* and *S. aureus*). *L. Monocytogenes* and *S. aureus* were shown to be more resistant to the antibacterial effects of stem than *E. coli*. Antibiotics also showed a greater zone of inhibition against *P. aeruginosa* (Table: 9). In Overall, it was shown that when compared to leaf or stem extract; antibiotics displayed a greater zone of inhibitions against bacterial strains (figure: 6). When compared to stem extracts, leaves extract demonstrated a higher zone of inhibition against *L. monocytogenes*, *S. aureus*, and *K. pneumoniae*, while stem extracts demonstrated a higher zone of inhibition against *E. coli*, *P. aeruginosa*, and *S. typhi* (figure: 7).

Table 9: antibacterial activity of Elaeagnus angustifolia L. plant

S. No.	Bacterial strains	Antibiotics	Stem	Leaves
1	*L. monocytogenes*	27±2.64BC	18.33±3.51BC	14.66±1.52C
2	*P. aureginosa*	33.33±3.05A	18.33±1.52BC	19±1B
3	*E. coli*	30±2AB	21±2.64AB	26±1.73A
4	*K. pneumoniae*	22.66±3.05C	16.66±0.57C	16±2BC
5	*S. aureus*	27.33±3.05BC	16.33±1.52C	14±2.64C
6	*S.typhi*	27.33±2.08BC	24±1A	27±3A

Data: mean±SD, letter indicate the significant difference in a same raw

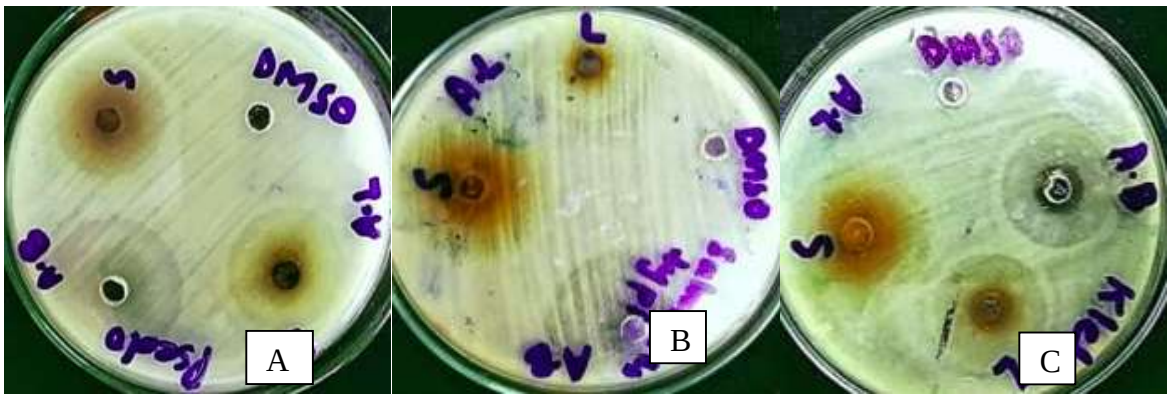

Figure 6: Antibacterial activities of *Elaeagnus angustifolia L* plants against bacterial strains **(A)** *Klebsiella pneumoniae* **(B)** *Salmonella typhi* **(C)** *Pseudomonas aeruginosa*

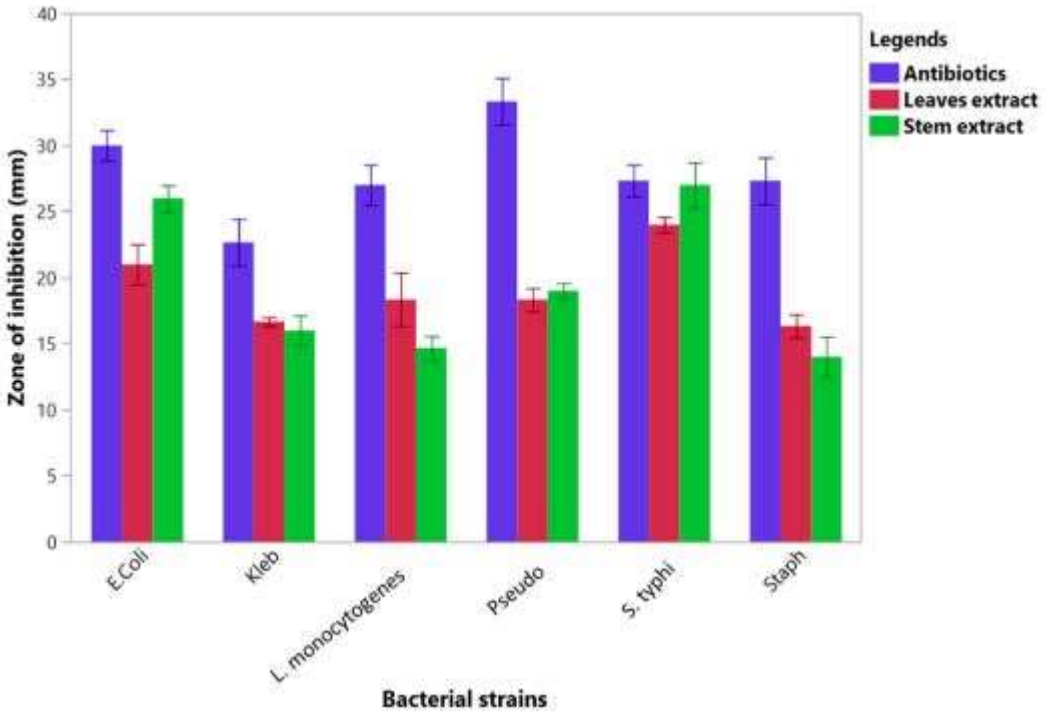

Figure 7: Antibacterial studies of Elaeagnus angustifolia L. against different bacterial strains

Antifungal activity of *Elaeagnus angustifolia L*. Stem and Leaves

According to the result of antifungal activity we revealed that the leaf extract indicated by (A) was shown to have a higher zone of inhibition (17.66±2.08) and a lower zone of inhibition (11.66±1.5) against the *M. citri* and *Penicillium* strains, respectively (Table: 10). In the instance of the stem extract indicated by (C), a high zone of inhibition was seen against strains of *Rhizopus stoloniferas*, but there was no discernible change in the stem extract's resistance to fungi (figure: 8). When it came to plant components, the stem shown more antifungal efficacy than leaf extract against *R. stoloniferas* and *Penicillium* strains. While leaves shown more antifungal activity than stem extract against *M. citri* strains (figure: 9).

Table 10: Antifungal activity of *Elaeagnus angustifolia L.* Stem and Leaves

S. No.	Fungal strains	Stem	Leaves
1	*R. stolonifer*	17±3A	14.66±0.57AB
2	*M. citri*	14.66±2.51A	17.66±2.08A
3	*Penicillium*	14.66±1.15A	11.66±1.52B

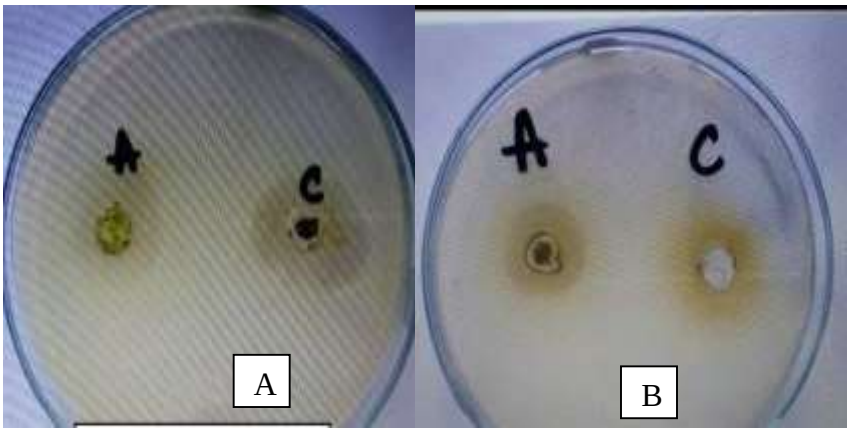

Figure 8: Antifungal activity of *Elaeagnus angustifolia L.* Stem and Leaves (A) *Penicillium* (B) *M. citri*

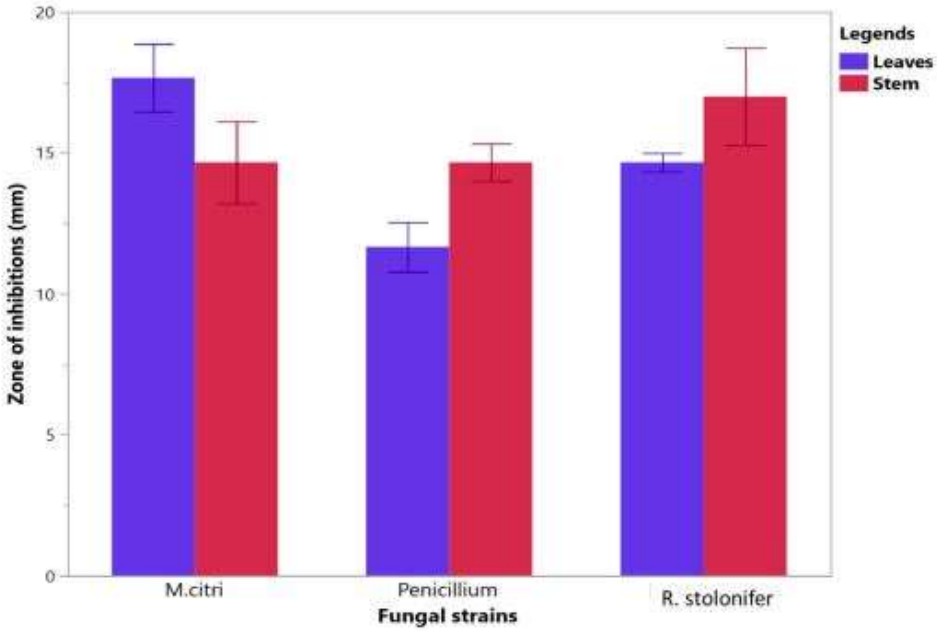

Figure 9: Graphical representation of Antifungal activity of *Elaeagnus angustifolia L.* Plant

Anti-Oxidant activity of *Elaeagnus angustifolia L.* Stem and Leaves

Elaeagnus angustifolia L. leaves and stem in methanolic extract: anti-oxidant analysis The DPPH test, a non-enzymatic method, is commonly used to provide basic information on the capacity of various medicinal plants to scavenge free radicals. In this study, the antioxidant potential of methanolic extracts of *Elaeagnus angustifolia L.* Leaves and stem are examined (Table: 11). The plant under study has antioxidant capability, as evidenced by the presence of bioactive components and its significant medicinal value. The methanolic extract of the plant stem under investigation exhibited a DPPH % inhibition of 76.32±0.07 at 1000 g/ml. Comparatively, a methanolic extract of leaves showed a 72.66±0.002 DPPH % inhibition at 1000 g/ml (figure: 10).

Table 10: Antioxidant activity of stem and leaves of *Elaeagnus angustifolia L*

Plant extract (Methanol)	**Concentrations**	**DPPH percentage inhibition (µg/ml) Mean±S.E.M**	**IC_{50}**
Leaves	1000	72.66±0.002**	200
	500	70.09±0.10**	

	300	52.13±0.15**	
	150	50.35±0.09**	
Stems	1000	76.32±0.07**	175
	500	57.35±0.23**	
	300	50.12±0.23**	
	150	50.28±0.40	

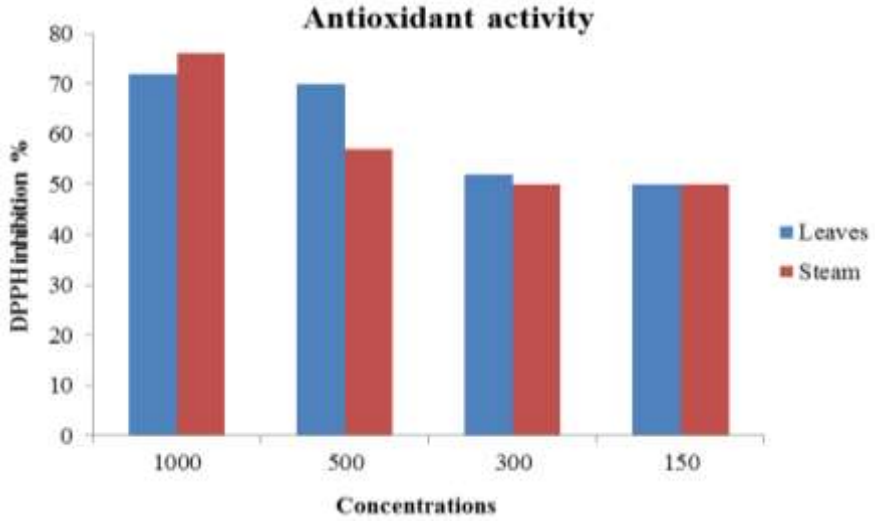

Figure 10: Graphical representation of antioxidant activity of *Elaeagnus angustifolia L* plant

1.1. Phytotoxic investigation of leaves and stem of Elaeagnus angustifolia L.

Elaeagnus angustifolia L. stem and leaves had excellent potential against Lemna minor L. as indicated in (Table: 11). Extract from the stem of the plant was more poisonous than the leaves. The growth of inhibition was 76.38±1.21 in stem extract at 1000 g/ml whereas it was 59.21±1.31 in leaves extract at the same dosage (figure: 11).

Table 11. Phytotoxic Activity of Leaves and Stem of *Elaeagnus augustifolia L.*

Samples	**% Growth inhibitions**			**LD_{50}**
	10 µg/m	**100 µg/m**	**1000 µg/m**	
N/Control Methanol	0.00±0.00	0.00±0.00	0.00±0.00	-
P/ Control (Atrazine100µg/ml)	90 ± 1.11	90 ± 1.11	90 ± 1.11	7.87
Leaves	38.32 ± 2.24	49.63 ± 1.39	59.21 ± 1.31	1.01
Stem	45.64 ± 2.76	59.28 ± 2.09	76.38 ± 1.21	4.39

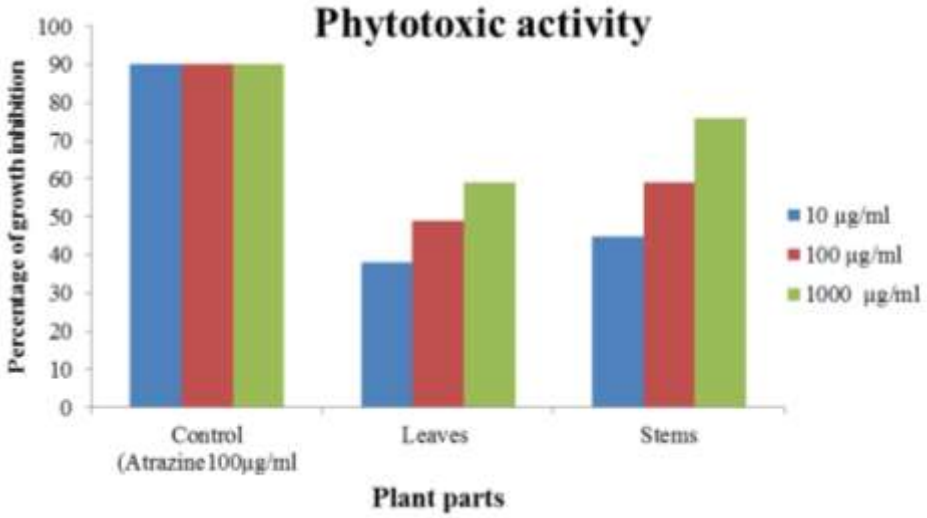

Figure 11. Graphical representation of phytotoxic activity of *Elaeagnus angustifolia L* plant

DISCUSSION

In the history of human civilization, medicinal plants have been crucial (Nostro et al., 2000). The primary source of natural resources is plants. There are many species, but only a few numbers have been documented in terms of their pharmacological and phytochemical properties [25]. The family *Elaeagnacea*e includes the plant *Elaeagnus angustifolia L*. This herb has therapeutic qualities. However, no research has been done about plant pharmacognostic study until far. So, by applying many pharmacognostic factors, we were able to determine this plant's therapeutic worth [1]. Numerous studies were conducted, including those on powder drugs, phytochemical screening, antibacterial, antifungal, antioxidant, phytotoxic, and cytotoxic substances. In order to determine the identification and purity of a plant, both macro- and microscopical examination is necessary. Powder drugs from the plant *E. angustifolia L*. were subjected to both macro- and microscopical examination [26]. Additionally investigated were morphological and anatomical characteristics. The first plant pharmacognostic standardization was completed. When examined under a microscope, powder drugs were found to include a variety of cell types, including spiral tracheids, epidermal cells, and sclerenchyma and parenchyma cells. Cell micrometry was also carried out. The architecture of the leaf epidermis revealed hexagonal-shaped epidermal cells with guard cell-like anomocitic stomata. Numerous plants extract revealed phytochemical components with important medicinal capabilities [27]. Studies on the photochemistry of *Elaeagnus angustifolia L*. reveal the existence of several secondary metabolites, including coumarins, alkaloids, terpenoids, carbohydrates, and oil. Alkaloids were present in the plant extract, demonstrating how closely the findings matched those of [28]. Plants' therapeutic properties are due to secondary chemicals. Accordingly, our research demonstrates that plants are a rich source of secondary metabolites that may be employed to combat a variety of pathogenic species. However, 57 different dangerous bacteria, including *E. coli, S. aureus, P. aureginosa, K. pneumoniae, S. typhi*, and *L. monocytogenes*, were tested against a methanolic extract of the plant *Elaeagnus angustifolia L*. (Leaf and stem). Both plant extracts demonstrated inhibition of all bacteria, but *S. typhi* showed the best results with the largest zone of inhibition (24 mm) in the leaf methanolic extract. While beneficial findings were also tested against *S. typhi* in stem methanolic extract, with a maximal zone of inhibition (28mm). *S. typhi*, a gram-negative bacterium, responds well to the plant. The plant has antibacterial properties as a result of the abundance of secondary metabolites [29]. Methanolic plant extracts were tested for antifungal effectiveness against a variety of fungi, including *Penicillium, M. citri*, and *R. stolnifer*. With a maximal zone of inhibition (17mm), the methanol-made leaf extracts shows promising efficacy against *M. citri*. The largest zone of inhibition against *M. citri* in stem extract is 15 mm. According to the current studies, plants can be a valuable source of antifungal activity. A phytotoxic test was conducted on Lemna Minor L. *Elaeagnus angustifolia L*. leaves and stem demonstrated significant activity, and at a concentration of 1000 g/ml, the stem and leaves demonstrated strong phytotoxic activity. It implies that *Elaeagnus angustifolia L*. is not a plant that is good for the environment. On brine shrimp, cytotoxic action was carried out. *Elaeagnus angustifolia L*. leaf and stem had cytotoxic activity as a result of the strong activity that was observed. *Elaeagnus angustifolia L*. leaves and stem registered 96% LD at 1000 ppm. By using the DPPH scavenging technique, antioxidant activity was carried out [30]. According to the research, plants have excellent antioxidant capacity. High absorbance has been seen at 1000 g/ml. To examine and identify the substance that is actually responsible for the antioxidant action, additional research is necessary.

CONCLUSIONS

Elaeagnus angustifolia L. macro- and micro-morphology provide strong evidence that it can be distinguished from other species in this genus. The plant *Elaeagnus angustifolia L*. has active secondary metabolites such as carbohydrates, phenol, alkaloids, and lipids, according to phytochemical research. The plant may be utilized to make additional antibiotics and medications to treat ailments, according to antibacterial and antifungal activity of stem and leaf extract. As a result of this plant's great activity in a phytotoxic examination, it is not good for the environment. Against brine shrimps, a plant has a great potential for cytotoxicity. Plants are powerful antioxidants.

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