RESULTS
4. RESULTS

I. Pharmacognostical studies of Pedalium murex and Martynia annua

Pedalium murex (Plate –1)

The plant is a herbaceous weed, fairly common in the waste lands. It occurs in tropical Africa, Sri Lanka, India and Pakistan.

Microscopic features

Leaf

The leaf is thick, smooth and even on both surfaces with prominent midrib (Plate 2.1). The midrib has shallow concavity on the adaxial side and semicircular prominent on abaxial side. It is 750 μm thick along the vertical plane; the abaxial part is 650 μm in horizontal plane. The abaxial part has a thin, but district epidermis with squarish cells. The ground tissue of the abaxial part consists of angular, thin walled compact parenchyma cells. The adaxial part of the midrib has a small patch of angular compact parenchyma cells and wide circular mass of cells beneath (Plate 2.2). The vascular bundle is single and prominent. It is a two-winged planoconvex structure. Xylem elements are narrow, thick walled and angular in outline arranged in parallel rows; phloem occurs in a thin sheath along the abaxial part of the xylem.
Lamina (Plate 2.3)

The lamina is 350 µm thick. The adaxial epidermis is fairly thick with spindle shaped thin walled cells. The layer is 10 – 15 µm thick. The abaxial epidermis is thin and have narrow rectangular cells. The mesophyll tissue consists of two adaxial layers of palisade cells; the upper layers of cells are wider and lower layer is narrow and short. The palisade zone is 150 µm in height. The spongy mesophyll tissue consists of five or six layers of lobed loosely arranged cells.

Epidermal trichomes (Plate 3)

These are two types of epidermal trichomes, both of them being equally abundant and secretory in function.

Type I. (Plate 3).

One type of trichome is multicellular, uniseriate and unbranched; it is straight and pillar like. It consists of wide, rectangular and thin walled cells; the number of cells varies from three to five. The terminal cells are narrow, thick walled and densely cytoplasmic indicating its secretory function. The trichome is 210 – 440 µm in height. The basal part is 30 µm wide; the terminal cell is 12 µm wide.
Type II (Plate 4).

The second type of trichome is unique to have a pyramidal basal cell; spindle shaped middle cell and two hemispherical head cells united into a single spherical unit. The head cells have dense and prominent protoplast and are secretary in function. These trichomes are 60 – 70 µm in height, the head is 40 µm in diameter.

Venation of the lamina (Plate 5).

The veins and vein-islets are uniformly thick. They form dense reticulation with distinct vein-islets and vein-terminations (Plate 5.1). The vein-islets are four or five sided, wide and distinct. The vein terminations are distinct, they are long, slender and unbranched (Plate 5.2) or they are forked once or repeatedly forming a dendroid appearance (Plate 5.3).

Petiole

The terminal (distal) as well as basal (proximal) part of the petiole was studied (Plate 6 & 7). The terminal part is arc-shaped in sectional view with adaxial shallow concavity (Plate 6). It is 1 mm thick vertically and 2.6 mm wide horizontally. It consists of thin epidermal layer of squarish cells and homogeneous circular or angular compact, thin walled ground tissue. The vascular system comprises of an arc of five discrete vascular bundles, of
which one is larger medium bundle, two are lateral bundles and two are smaller marginal bundles (Plate 6). The medium bundle is flat and collateral measuring 400 µm horizontally and 150 mm vertically. It has scattered xylem elements and thin band of phloem (Plate 7). The lateral bundle is circular, 60 mm in diameter and the xylem elements are angular and thick walled; the elements are in clusters; the phloem is small nests (Plate 7). The marginal bundle is top-shaped, collateral and measures 100 µm.

Basal (proximal) part of the petiole is flat and wide. It is 1 mm vertical plane and 3.9 mm in horizontal plane (Plate 7). It has a thin but distinct epidermal layer of squarish cells. Inner to the epidermis is a narrow zone of two or three layers of collenchyma cells. Rest of the ground tissue is parenchymatous; the cells are large, circular, thin walled and compact. Discrete vascular bundles occur in a horizontal row. The bundles include a larger medium one, with two small adjoining bundles, a pair of lateral bundles and two pairs of marginal bundles of diminishing size. The bundles are collateral with clusters of xylem elements and small nests of phloem elements (Plate 7).
Stem

a. Young stem (Plate 8). It is a primary stage of growth incipient secondary thickening. The epidermis is thin with small spindle shaped cells. The cortex was broad measuring 650 μm in width. It consists of radially oblong, thin walled, less compact parenchyma cells, most of them having undergone radial divisions (Plate 8). The vascular cylinder consists of several radially oblong segments of xylem and phloem in collateral position; the segments are separated from each other by wide parenchymatous medullary rays. The medullary rays consist of regular radial files of rectangular squarish cells. These cells are derived from the interfascicular cambium which is at its early stages of inception.

The xylem segments are narrow, radially stretched and consist of a few vessel multiples or chains and sclerenchymatous tissue (Plate 9). The vessels are angular, thick walled and wide lumened; they are up to 50 mm in diameter. Xylem fibres are thick walled and lignified. Phloem is in narrow conical cap on the outer end of each xylem segment.

b. Older stem (Plate 8 & 9). The old stem shows fairly thick secondary tissues. However, no periderm is formed. The epidermis is thin, but distinct and intact. The cells are narrowly oblong with thick cuticle. The cortex is 650 μm wide. It is homogeneous and parenchymatous; the cells are
tangentially elliptical with radial walls and are less compact. The cells are wide and have cell inclusions. The vascular cylinder has thick radial segments of secondary xylem; the segments are separated from each other by parenchymatous vascular (xylem) rays which are wide bands. Secondary xylem has thick walled narrow fibres and wide, angular, thin walled radial multiple vessels. The vessels are 20 – 60 µm in diameter. On the outer part of each xylem segment are thin radial lines of sieve elements and phloem parenchyma. The Pith is wide, and parenchymatous. The pith cells are large, thin walled of varying shape and size.

**Powder Microscopic features of stem elements**

Macerated powder of the stem sample exhibits the following elements:

1. **Xylem Fibres** (Plate 10). The xylem fibres are thin walled with wide lumen. They have simple pits and cell inclusions; they are also septate. The fibres are 500 – 600 µm long and 30 µm wide along the middle part.

2. **Vessel elements** (Plate 11): Vessel elements of both primary xylem and secondary xylem are seen in the powder. The primary xylem elements have spiral, annular or scalariform lateral wall thickenings (Plate 11.1). The secondary xylem elements have pitted lateral wall thickenings. The vessel
elements have simple horizontal perforation plate. Some of the elements may have oblique perforation plate (Plate 11.2). The vessel elements are 150 – 300 µm long.

Root (Plate 12)

The root measuring 1.15 µm radius was studied. It consists of broken obliterated epidermis and disorganized cortex. Small masses of sclerenchyma elements are seen in the cortical zone. Secondary phloem is narrow and consists of short radial lines of sieve elements and phloem rays. Secondary xylem is dense, solid and circular in outline. No growth rings are evident. Vessels are diffuse in distribution. They are angular, thin walled, solitary or in multiples of two. The diameter of the vessels ranges from 40 – 80 µm. Xylem fibres are thin walled with wide lumen and it walls are lignified. Xylem rays are fairly wide and straight.

Powder microscopic observations of the root (Plate 13 & 14)

The powder (Macerated materials) exhibits the following two types of elements:

1. Vessel elements (Plate 14): The vessel elements are long and cylindrical. They have short tail at one end or tailless. The lateral wall pits
are elliptical, alternate and bordered. The perforation plate is simple, either oblique or horizontal. The elements are up to 390 µm long.

2. **Xylem fibres** are wide, thin walled with slit-like pits or without pits (Plate 13). Most of the fibres are wide; narrow fibres are less common. The fibres are 500 – 600 µm long and 40 µm wide.

**Fruit**

The fruit is a dry drupe with elevate, thin epicarp, fleshy broad mesocarp and stony endocarp. The epicarp is represented by a single epidermal layer of narrow, elongated cells. Two types of epidermal glandular trichomes present on the fruit wall (Plate 15). First type of trichome bears 1 or 2 celled stalk with spherical head containing dark inclusion. Second types of trichomes are sessile spherical head with dilated thin walls. Inner to the epicarp is a broad zone of mesocarp, which is composed of aerenchyma and parenchyma cells; it is three layered and 350 µm wide. The inner spongy parenchymatous tissue consists of wider air chambers surrounded spherical parenchymatous cells (Plate 15 & 16).

The endocarp consists of wide and hard stony part, which comprises of sclerenchymatous bands and well developed vascular stands with curved
lateral branches (Plate 15 & 16). The fruit has thick green seed with spines at the base of the surface and soft parenchymatous seed coat.

*Martynia annua* L.

**Midrib of the leaf (Plate 17 & 18)**

The midrib is quite prominent with thin wing like lamina (Plate 17.1). The midrib has a thick conical adaxial hump and a large circular abaxial part. It is 1.5 mm thick in vertical plane and 1.15 mm in horizontal plane. It has a thin epidermal layer of thin walled squarish cells. The adaxial hump consists of small compact thick walled parenchyma cells. The abaxial midrib has two or three layers small compact cells. The remaining portion has layers thin walled compact ground tissue. The vascular system consists of a prominent horseshoe shaped vascular strand. It has wide, circular thin walled xylem elements with thin layer of phloem external to the xylem (Plate 18). The xylem elements are up to 50 μm wide.

**Lamina (Plate 17.2)**

The lamina is smooth and even. It is 170 μm thick. It is dorsiventral. The adaxial epidermis is thin and small, thick walled rectangular cells. The abaxial epidermis is thinner and the cells are small and circular. The mesophyll is differentiated into wide adaxial spongy parenchyma zone. The
palisade cells are 90 µm in height; they are narrow, cylindrical and are arranged with wide spaces. The spongy parenchyma cells are three or four layered, small and lobed forming wide air chambers (Plate 17.2).

**Epidermal tissue (Plate 19)**

The abaxial epidermis is stomatiferrous. The stomata are anomocytic type. The guard cells are circular with wide stomatal pore is 50 µm long. Some of the stomata are reduced in size measuring 25 µm long; such small stomata do not have distinct stomatal pore (Plate 19). The epidermal cells are amoeboid in shape; their anticlinal walls are wary and thin (arrows in the Plate 19). The stomatal index is 35-45 mm².

**Epidermal Trichomes (Plate 20 & 21)**

The epidermal trichomes are variable both in their structure and function. These are both non-glandular (covering) type and glandular types of trichomes. The non-glandular trichomes are rare. The glandular trichomes are abundant and they are of three major types:-

1. **Club-shaped glandular trichome (Plate 20.3)**

These are short and club shaped bodies with a short, 2-celled neck and elliptical body. The body is longitudinally ridged. The gland is erect and
arises from epidermal cell. The trichome is 60 µm in height and the glandular head is 25 µm thick.

**2. Brush-shaped glandular trichome (Plate 20.1)**

These long slender trichomes have vertical row of cells. They are uniseriate, unbranched. The trichome has a short, circular; cup shaped basal cell, long, wide basally wider stalk cell. Narrow, elongated cylindrical neck cell, a sub terminal funnel shaped cell and a terminal, elongated compact cluster of glandular cells resembling the painting brush. The terminal clusters of glandular cells have dense cytoplasm and are secretory in function. Total length of the trichome is 490 µm; the terminal gland is 50 µm long and 40 µm wide.

**3. Umbrella shaped glandular trichome (Plate. 21)**

The trichomes have long, rectangular, wide three-celled stalk, a barrel shaped neck and a hemispherical umbrella shaped glandular body. The trichome is gradually tapering towards the tip bearing spherical body. The body consists of several radially elongated dark, secretary cells. The trichome is 600 µm long; the basal cell is 90 µm wide; the terminal body is 170 µm wide; 40 X 50 µm.
**Petiole (Plate. 22)**

The petiole is wide, circular with hollow central canal (**Plate. 22.1**). The solid peripheral portion is more than 1 mm thick. It is a narrow distinct epidermal layer of spindle shaped cells with prominent cuticle. The inner to the epidermis are 5 or 6 layers of collenchyma cells followed by inner zone of about 10 layers of large, compact, thin walled parenchyma cells. The vascular tissues occur in thin continuous cylinder comprising of solitary, wide, circular thin walled vessels and small nests of phloem outside the xylem elements (**Plate. 22.2**). Inner to the vascular cylinder and outer thin central canal is wider zone of large, thin walled compact parenchyma cells.

**Stem (Plate. 23.1 & 23.2)**

The stem is herbaceous with primary state of growth. It consists of a thin intact epidermis, which is continuous all around the stem. It bears many trichomes of glandular and non-glandular types. The epidermal cells are small and rectangular with thick cuticle (**Plate. 23**). The Cortex is wide and heterogeneous comprising of outer zone of collenchyma and inner zone of parenchyma (**Plate. 24**). The collenchymas zone is 250 μm wide. The collenchyma is lacunate collenchyma type with minute intercellular spaces
in between the inner parenchyma zone. It has radially oriented hexagonal cells with thin walls; this zone is also 250 µm wide.

The vascular cylinder is thin and continuous measuring nearly 300 µm wide. It consists of outer small groups of phloem dispersed all around the xylem cylinder. The outer portion of the xylem has radial files of thin walled rectangular cells; following this region occur vessel elements of larger size, circular, thin walled and randomly distributed. The vessels are about 60 µm in diameter. Xylem fibres are lacking. The pith is wide, parenchymatous, thin walled, hexagonal to polygonal and compact.

**Root (Plate. 25 - 28)**

Both thin and thick roots were studied. Thin root is 70 µm thick. It has no definite periderm; the epidermis and a portion of the cortex are broken and obliterated. The remaining portion of the cortex consists of four or five layers tangentially elongated thin walled parenchymatous cells. Secondary phloem zone is fairly wide and continuous all around to xylem cylinder (Plate. 25). It consists of short radial rows of sieve elements and parenchymatous cells. Phloem rays are not well defined. Secondary phloem is 150 µm wide.
Secondary xylem of this root has dense, diffuse vessels and xylem fibres. The vessels are wide measuring 15-30 µm in diameter. They are fairly thick walled, angular in outline, mostly solitary or less frequently in multiples of two. (Plate. 27). Xylem fibres are wide with thin walls, which are lignified. In the thick root, xylem rays are quite prominent in transactional view. They are large in the beginning and dilate into 2-5 cells wide towards the periphery. At certain regions, the xylem rays become much wider and dilated, especially in the outer part of the xylem (Plate. 27). No growth rings are evident in the thick roots also. The vessels are diffuse in distribution. They are mostly circular, less frequently angular in outline, solitary or in multiples of two or three (Plate. 27). The vessels are 40-100 µm wide.

In the thick root, periderm is wide and fissured at several places. The fissures are wide and shallow (Plate. 28). It is about 150 µm wide and four or five layered. The cells are thin walled and tabular in shape. Cortex is 700 µm wide and the cortical cells are highly dilated tangentially elongated and radially compressed. Secondary phloem is 250 µm wide. The phloem cells are intact and well preserved. The sieve elements are 30 µm in diameter; they are angular with companion cells placed along the corner. Phloem rays are short, one cells wide with larger cells at the outer end (Plate. 28).
Fruit

The fruit is a drupe with thin epicarp, fleshy mesocarp and stony endocarp. The epicarp is represented by an epidermal layer of narrow, rectangular cells. Epidermal glandular trichomes abundant on the fruit wall (Plate. 29). Inner to the epicarp is a wide zone of mesocarp, which is differentiated into outer palisade parenchyma cells and inner spongy parenchyma like parenchyma tissue. The palisade like zone has narrow, elongated cells; it is three layered and 650 µm wide. The inner spongy parenchymatous tissue consists of wider air chambers surrounded spherical parenchymatous cells (Plate. 29).

The endocarp consists of wide and hard stony part, which comprises of complex network of fibres enclosing circular wide masses of parenchyma cells. The endocarp protrudes into the centre of the fruit in the form of thick, knob shaped body, dividing the fruit into four false chambers. The protruding endocarp knob is 4 mm thick (Plate. 30). The fruit has thick seed with spiny surface and soft parenchymatous seed coat (Plate. 31). The seed coat is 2 mm thick.

Stomatal studies were conducted in upper and lower epidermis of

*Pedalium murex* and *Martynia annua* leaves. Total number of stomata,
epidermal cells, vein – islets, vein termination, palisade ratio, number of
trichomes in leaf, petiole and stem were measured and tabulated (Table. 7 &
8).

II. Study of Powdered materials

The organoleptic characteristics and analytical values namely, loss on
drying 110 °C, pH values of aqueous solution of powdered materials, total
ash values, acid insoluble ash values, water soluble ash values, sulphated ash
values, amount of sodium and potassium, extractive values of successive
extracts of Pedalium murex (PM) and Martynia annua (MA) are
summarized in Table. 5 & 6. The powders of PM and MA are distinguished
by colour appearance – pale and dark green respectively. PM powder has
slightly bitter taste; while MA is tasteless. The total ash value of MA powder
is more than that of PM. The amount of potassium and sodium are higher in
PM than MA. Extractive values in petroleum ether, acetone, methanol, for
PM is higher than MA but extractive values in chloroform and water is
maximum in MA that that of PM. The results of physiochemical studies of
PM and MA indicate both similarities and dissimilarities and powders of
both plant species could be distinguished on the basis of their physio-
chemical constants.
III. Qualitative phytochemical screening

Results of preliminary phytochemical screening were given in Table 9 & 10. Alkaloids, carbohydrates, glycosides, saponins, proteins, phytosterols, fixed oils, tannins and phenols, flavonoids, gum and mucilage were found in both PM and MA. No plant reacted positively to test indicating the presence of glycosides. The results of qualitative phytochemical tests revealed appreciable amount of flavonoids in extract of MA than that of PM. Phytosterols are found only traceable amounts in both the plant species. Saponin content is found only in PM whereas volatile oils not available in the extracts of both plants species. The table 9 & 10 shows similarities and dissimilarities between PM and MA extracts.

IV. Fluorescence analytical studies

Fluorescent characteristics of powder as such and after its treatment with certain chemical reagents were observed in day light as well as under UV radiation are summarized in Table. 11 & 12. The results shows both similarities and dissimilarities among the powders of PM and MA studied. Characteristic appearance of different colours is observed in powders of PM and MA as such in day light and under UV light after treating them with acetic acid, ammonia solution, 5 % KOH in alcohol, concentrated HCl and
concentrated HNO$_3$. Fluorescent characteristics of PM powder have diagnostic values, as they are different from MA.

Powders of PM and MA as such, when observed under both day light and UV light appears pale green and dark grey respectively. Powders of both PM and MA exposed to concentrated picric acid as well as nitric acid produced the same results whereas treated with ammonium hydroxide and iodine solution observed under both light conditions gives slightly variable results by the extracts of both species.

V. Estimation of minerals in alcoholic extracts of Pedalium murex and Martynia annua

Minerals were estimated in alcoholic extracts of Pedalium murex and Martynia annua and tabulated (Table. 13). Considerable amount of variations were found in mineral estimates of the both plant species. Nitrogen, potassium, sodium, Manganese, Boron were higher in Pedalium murex whereas organic carbon, calcium, sulphur, zinc copper, iron were found more in Martynia annua.

VI. Thin Layer Chromatography (TLC) Studies

Thin layer chromatographic studies of aqueous extract of both taxa were made (Plate. 32). TLC profile of ethanolic extract reveals the
formation of characteristic bands, their positions and intensities of both species were recorded. In both plant species tested, the TLC patterns of separation of bands are varied with plant species as well as concentration of compounds present.

R_f values of aqueous extracts of PM and MA were determined on TLC. On TLC, when BAW as a mobile phase, PM and MA left single spots with R_f values 0.85 and 0.79 respectively. At 60% AcOH, the plant samples of MA showed two spots at R_f values 0.65 and 0.86 and PM showed a single spot at 0.88 R_f value (Table. 14).

In TBA mobile phase, MA showed a single band with R_f value of 0.84 and no spot was seen at PM sample. When water as mobile phase, there is no spot for MA and two spots with R_f values 0.28 and 0.30 appeared in PM. In ferosal mobile phase, 0.60 and 0.71 are the two R_f values shown in MA and PM showed a single spot with a R_f value of 0.87.

Thus, the two plant samples, PM and MA had distinguished TLC profiles in the five mobile phases used. Both the plants samples had varying way of spots. This indicates that biological active compounds differ qualitatively in both the species.
VII. Gas Chromatography–Mass Spectral (GC-MS) Studies

The constituents were identified by comparing GC-MS data with those given in library and reported in literature. The components present in the alcoholic extract of PM and MA are given in the Table. 15 & 17 and those revealed in the aqueous extracts of PM and MA are given in the Table. 16 & 18.

Of the 28 compounds of PM alcoholic extract, Oleic acid constituted the major part (22.70%) and propanoic acid, 1-methylpropyl ester was the least part (0.24%). In MA’s alcoholic extract also the oleic acid was present in higher amount (20.55%) and 1,4-cyclohexanediol, cis – was present in smaller amount (0.15%).

In aqueous extracts of PM of 22 compounds, oleic acid is in larger amount (80.18%) and the compounds like 2,5- dimethyl-4-hydroxy-3(2H)-furanone; 2(3H)-Furanone, dihydro-4-hydroxy-; (+)-3,5-di-O-methyl-Z-deoxy-D-ribo-1,4-lactone; 1,6; 3,4-dianhydro-2-deoxy-a-d-lyxohexopyranose; Hexadecanal and cyclohexane, 1,1’-(2-tridecyl-1-3-propanediyl) bis are present in trace amounts. While in MA’s aqueous extract, Ethanol-2-(2-amino-ethoxy)- is in highest amount (46.77%) and the 1-hexyl-2-nitrocyclohexane is the trace amount elements.
VIII. Anti-inflammatory activity of Alcohol & H₂O extract of *Pedalium murex*

a. Carrageenan – induced rat hind paw oedema

The extract showed maximum inhibition of the carrageenan induced rat paw oedema. At the end of 3 hrs and results are given in Table 16 & Fig. 21. Oedema effect of alcoholic extracts (250 mg /kg) and aqueous extract (250 mg /kg) treated groups of 20 % and 27% respectively. It was found to be increase significant as compared to 13 % of increase of paw volume produced by diclofenac sodium. Also, the H₂O & alcohol extract of PM produced dose dependent inhibition of carrageenan induced rat hind paw oedema. However, the alcoholic and aqueous extract of exhibited high anti-inflammatory effect as compared to standard anti-inflammatory drug.

b. Cotton pellet granuloma

The weight of the granulation tissue formation was significantly increased by the same groups (250 & 500 mg/kg) of test and diclofenac sodium. The inhibitory effect of 250 & 500 mg/kg of *Pedalium murex* aqueous extract treated group were 65% and 55% respectively. The percentage of inhibition of plant extract is comparable with the effect of diclofenac. The results are summarized in Table 19.
The results presented in Table. 21 and show the effect of drug treatment on the mean weights of cotton pellet. Percentage of increase of granuloma tissue formation was found to be significant for the alcoholic extract treated with a dose level of 250 mg/kg. The inhibitory effect of alcoholic extract at the dose of 250 mg/kg body weight was found to be high while compared to that of 5 mg/kg of diclofenac sodium.

**Anti-inflammatory activity of Alcohol & H$_2$O extract of Martynia annua**

a. Carrageenan – induced rat hind paw oedema

The alcohol and aqueous extract showed maximum inhibition of the carrageenan induced rat paw oedema. At the end of 3 hours and results are given in Table. 16 & Fig. 20 & 21. Oedema effect 250mg/kg of alcohol extract and 250 mg/kg of aqueous extract treated groups of 33% and 28% respectively. It was found to be significant as compared to 13 % of increased paw volume, produced by diclofenac sodium. In addition, the alcohol and aqueous extract of Martynia annua produced dose dependent inhibition of carrageenan-induced rat hind paw oedema. Oedema effect of aqueous extract of 500 mg/kg and alcoholic extract of 250 mg/kg treated groups shows equally 28%. However, the alcoholic and aqueous extracts exhibited
high anti-inflammatory effect as compared to standard anti-inflammatory drug.

b. **Cotton pellet granuloma**

The weight of the granulation tissue formation was significantly increased by the same groups (250 & 500 mg/kg) of test compared to diclofenac sodium. The inhibitory effect of 250 & 500 mg/kg of *Martynia annua* aqueous extract treated group were 72% and 65% respectively (**Fig. 22**). The percentage of inhibition of plant extract is comparable with the effect of diclofenac. The results are summarized in **Table. 20**.

The results presented in **Table. 17** and show the effect of drug treatment on the mean weights of cotton pellet. Percentage of increase of granuloma tissue formation was found to be significant for the alcoholic extract treated with a dose level of 250 mg/kg. The inhibitory effect of alcoholic extract at the dose of 250 mg/kg body weight was found to be high while compared to that of 5 mg/kg of diclofenac.

**IX. Diuretic activities of *Pedalium murex* and *Martynia annua***

Diuretic activity of *Pedalium murex* (PM) and *Martynia annua* (MA) were studied in detail (**Table. 21**) (**Fig. 24-28**). Diuretic activity was significantly increased with extracts treated test animals than control
animals. In PM, high amount of urine output were recorded 2.96 ml in alcohol extract (500 mg/kg) followed by 2.78 ml alcohol extract (500 mg/kg) and lowest urine output 1.02 ml recorded in untreated control. In MA, maximum amount of urine output recorded 2.49 ml in alcoholic extract of MA alcohol extract (500 mg/kg) followed by 2.14 ml in aqueous extract of MA at dosage level of 500 mg/kg than the control (1.02 ml).

Maximum sodium content (134.7 mEq/I), potassium content (142 mEq/I) and chloride content (109 mEq/I) were recorded in alcohol extract of PM at dosage level of 500 mg/kg and minimum sodium content (87.4 mEq/I) and potassium content (107 mEq/I) and chloride content (92 mEq/I) were estimated in aqueous extract of MA at dosage level of 250 mg/kg than that of control. Sodium-potassium ratio was recorded as maximum (0.94%) in alcohol extract of PM at dosage level of 500 mg/kg where as minimum (0.70 %) in alcohol extract of MA at dosage level of 250 mg/kg but all treated results are higher than control (1.06 %). Overall, diuretic activities of both PM and MA were higher than that of untreated control.
X. Anti-microbial activities of *Pedalium murex* and *Martynia annua* extracts

Extracts of *Pedalium murex* (PM) and *Martynia annua* (MA) were tested for antimicrobial activities against *Escherichia coli*, *Staphylococcus epidermidis*, *Klebsiella pneumoniae*, *Azatobactor diversus* and *Enterococcus faecalis*. Three different concentrations, namely 10%, 20% and 40% of petroleum ether, benzene, chloroform, alcohol and water extracts of both plants were used to screen anti-microbial activity by well and disc method (Table. 22-25) (Plate. 33-37).

Benzene, chloroform and alcohol extracts of PM showed inhibition against *E. coli*, *S. epidermidis*, *K. pneumoniae* and *E. faecalis* in a dose dependent manner (Table. 22; Plate. 33A – 34E). Maximum inhibition of growth of the above pathogenic bacteria was observed at 40% conc. All the five extracts of PM did not inhibit the growth of *Azatobactor diversus*. Water extract of PM did not have any inhibitory activity against all the bacteria tested. Alcoholic extract of PM inhibited only *E. coli* and no inhibition was observed for other pathogenic bacteria tested.

Antifungal activity of pet.ether, benzene and alcohol extracts of PM showed inhibition against *A. niger* in a dose dependent manner (Table. 24).
40% conc. of Benzene and alcohol extracts showed maximum inhibitory activity and pet.ether showed maximum activity at 20 conc., Chloroform extract of PM gave dose dependent activity against the dermatophytic fungus, *Candida albicans*. All the five extracts of PM did not show any inhibitory activity against *A. flavus*.

Pet. ether, chloroform and alcohol extracts of MA showed inhibitory activity against *E.coli*, *S. epidermidis*, *K. pneumoniae* and *E. faecalis* in a dose dependent manner. Maximum inhibitory activity was observed in 40% concentration all the above extracts.

Benzene extract inhibited growth of *E. coli* and *K. pneumoniae* in a dose dependent manner. Water extract showed inhibition against *S. epidermidis* and maximum inhibition was observed at 40% conc. All the above extracts did not show any inhibitory activity against *Azatobactor diversus* (*Table.23 & Plate 34F to 37C*).

All the five extracts of MA did not show any antifungal activity and the results are given in *Table. 25*. 