Highlights
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- The Barmer district is situated between 24°58’ - 26°32’ North latitude and 70°5’ – 72°52’ East longitude covering geographical area of 28,387 sq km.

- It the second largest district in the State covering about 8.29% of its total area. It is surrounded by Jaisalmer in the north, Jalore in the south, Pali and Jodhpur in the east and Pakistan in the west.

- Geographically, the area as a whole forms a part of the Great Indian Desert. A part from a small off shoot of the Aravalli hills in the east, the area is a vast sandy tract.

- The only major drainage course in the area is Luni River, which flows from Samdari, passing through Balotra. The river is ephemeral, flowing only in response to heavy precipitation.

Climatological Studies

- The characteristic features of the climate of the district are its dryness, extremes of temperature and the fitful and erratic nature of rainfall. The year may be divided into four seasons, winter from November to March, summer season from April to June, monsoon from July to mid-September and post-monsoon season up to the end of October. In summers the temperature soars to 48°C and in winters, it drops to 5°C.

- During the period from January, 2012 to December, 2013, the maximum rainfall (139.5 mm) was recorded in August, 2013.
• During the period from January, 2012 to December, 2013, the average maximum temperature (44.7°C) was recorded in June, 2012.

• During the period from January, 2012 to December, 2013 the average maximum relative humidity (80.0%) was recorded in the month of September, 2012.

Soil Analysis

• In the mechanical analysis of soil sand, silt and clay were quantitatively estimated. The data of mechanical composition reveal that the soil of all the three sites largely consists of fine sand followed by silt and then by clay.

• The maximum percentage of sand was observed in the Pachpadra soil (88.4%) at a depth of 22 - 45 cm.

• The water holding capacity was found maximum in Sindari soil (41.48%) at a depth of 22 - 45 cm.

• The amount of bulk density was observed maximum in Chohatan soil (1.59 gm/cm$^2$) at a depth of 0 - 22 cm.

• The maximum percentage of absolute specific gravity was observed in soil (9.34%) at 0 - 22 cm depth.

• The maximum pH value was estimated in Chohatan soil (7.83) at 0 - 22 cm depth.

• Maximum electrical conductivity was found in Chohatan soil and Pachpadra soil (0.22 mmhos/cm) at 0 - 22 cm depth.
• CaCO$_3$ percentage was found maximum in Sindari soil (4.4%) at 22 - 45 cm depth.

• Organic carbon content was found maximum (0.13%) in Sindari soil at 22 - 45 cm depth.

• The amount of available nitrogen was observed maximum in Chohatan soil (19 kg/ha) at 0 - 22 cm depth.

• The value of available phosphorus was observed maximum in soil of Chohatan (25 kg/ha) at 0 - 22 cm depth.

• The quantity of potassium was maximum (300 kg/ha) in the soil of Sindari at 0 – 22 cm depth.

• The quantity of micro nutrients like zinc, copper and manganese was observed higher (4.2 ppm, 3.01 ppm and 7.02 ppm) in Chohatan soil at 0 - 22 cm depth.

**Ethnomedicinal Aspects of Selected Plant Species**

• Fifteen plant species have been selected from ethnomedicinal point of view from study area.

• The information about the ethnomedicinal uses of plants to treat various diseases was collected from local people, vendors, tribal communities, social workers, forest officers, agricultural officers and experts of Ayurvedic field.

• The name of plant, its family, local name, habitat, morphological characteristics, flowering and fruiting, phytochemical aspects, economic
as well as medicinal uses have been described.

Plants Studied for Phytochemical Aspects

- Three plant species (*Clerodendrum phlomidis*, *Lycium babarum* and *Sida cordifolia*) have been selected for the phytochemical investigations which are growing in Chohatan, Pachpadra and Sindari areas of Barmer district.

- *Clerodendrum phlomidis* is a large shrub found throughout the area, commonly known as Arni. It is one of the important ingredients of the Ayurvedic formulation ‘Dasamula’. Bhils apply leaf juice to cure syphilis. The decoction of fresh roots is given by them orally to cure gonorrhoea and to the children to cure measles. Tribals mix the twigs of this plant with the fodder of their cattle suffering from diarrhea and worms. Decoction of leaves and poultice is used for curing piles. Native apply leaf juice on the pimplles and wounds. Decoction of leaves is taken orally to cure joints pains. Leaf paste is tide over stomach for reducing urinary inflammations. Seed powder is useful in the treatment of rheumatism.

- *Lycium babarum* is a common plant with variable size and shapes of the leaves; common on sand forming open scrub jungle, throughout the area. It is commonly known as Morali. The leaves pounded and mixed with ‘ghee’ are applied to abscesses. The stem bark is pounded and the powder blow in to the nostril of horses against bronchitis.
• *Sida cordifolia* is found throughout as a common weed under shade commonly known as Bala. Leaves and roots are pounded and applied locally on boils to hasten suppuration by natives. Tribe use Powder of root bark in the treatment of urinary and nervous diseases. Powered root with milk is given in leucorrhoea. Seed possess demulcent and laxative properties and are used in bowel complaints. The decoction of root with ginger is also taken orally as a febrifuge.

**Evaluation of Nutritive Contents**

• Dry matter percentage was found maximum (96.90%) in the fruits of *Sida cordifolia* collected from Pachpadra area.

• The maximum (17.24%) amount of crude protein content was estimated in the fruits of *Clerodendrum phlomidis* collected from Sindari area.

• Maximum (45.66%) crude fibre content was found in roots of *clerodendrum phlomidis* collected from Pachpadra area.

• Crude fat (ether extract) concentration was found maximum (1.20%) in fruits of *clerodendrum phlomidis* collected from Sindari area.

• Maximum (15.66%) total ash was found in the shoots of *Lycium barbarum* collected from Chochatan area.

• The amount of nitrogen free extract (NFE) was observed maximum (58.27%) in shoots of *clerodendrum phlomidis* collected from Sindari area.

• Maximum (89.33%) total carbohydrate contents was found in the roots
of *Sida cordifolia* collected from Chochatan area.

- The amount of organic matter was found maximum (95.16%) in the roots of *Sida cordifolia* collected from Chochatan area.

**Evaluation of Mineral Contents**

- Calcium content was observed maximum (1.71%) in the fruits of *Sida cordifolia* collected from Chohatan area.

- Concentration of phosphorus was observed maximum (1.17%) in the fruits of *Sida cordifolia* collected from Chohatan area.

- Maximum (2.28%) potassium content was found in the fruits of *Lycium barbarum* collected from Pachpadra area.

- Sodium content was found maximum (1.19%) in the fruits of *Sida cordifolia* collected from Pachpadra area.

**Estimation of Amino Acid Contents**

- Maximum total amount (49.1mg/g.d.w.) of free amino acids was found in the fruits of *Clerodendrum phlomidis*.

- Maximum amount (36.7 mg/g.d.w.) of the total bound amino acid was observed in the shoots of *Sida cordifolia*.

**Evaluation of Ascorbic Acid Contents**

- In *Clerodendrum phlomidis* maximum (90.12 mg/100 g.d.w.) ascorbic acid contents was found in fruits collected from Sindari area.

- In *Lycium barbarum* maximum (90.40 mg/100 g.d.w.) ascorbic acid contents was found in fruits collected from Chohatan area.
• In *Sida cordifolia* maximum (95.60 mg/100 g.d.w.) ascorbic acid contents was found in the fruits collected from Pachpadra area.

• Among all the three plant species the maximum (95.60 mg/100 g.d.w.) amount of ascorbic acid was found in fruits of *Sida cordifolia* collected from Pachpadra area.

**Antimicrobial Screening**

• Leaves of *Clerodendrum phlomidis*, *Lycium babarum* and *Sida cordifolia* were extracted separately with ethyl ether and 50% ethanol in succession and these extracts were tested (Khanna and Staba, 1968) for their antimicrobial activity. Micro-organisms used for screening were *Staphylococcus aureus* (Gram positive), *Escherichia coli* (Gram negative) and a fungal pathogen, *Candida albicans*.

• Maximum antimicrobial activity was exhibited by the leaves extracts (alcoholic extract) of *Euphorbia caducifolia* against *Escherichia coli*, whereas leaves extracts of *Leptadenia pyrotechnica* showed maximum antifungal activity against *Candida albicans*.

**Evaluation of Antimicrobial Principles (Flavonoids)**

• Qualitative estimation of flavonoid contents from leaves of selected plant species (*Clerodendrum phlomidis*, *Lycium babarum* and *Sida cordifolia*) have been carried out by Thin Layer Chromatography. Flavonoids have been estimated quantitatively by Colorimeter method.

• Among all the plant samples tested the total flavonoid contents were
found maximum (1.74 mg/g.d.w.) in leaves of *Clerodendrum phlomidis* collected from Chohatan area.

- The maximum quercetin (0.96 mg/g.d.w.) was found in leaves of *Clerodendrum phlomidis* collected from Chohatan area.

- The maximum amount of kaempferol (0.79 mg/g.d.w.) was found in leaves of *Sida cordifolia* collected from Pachpadra area.

**Conclusion**

- The climatological studies and soil analysis of Barmer district indicate that it has semi-arid climate with large variations in temperature and has scanty rainfall. Soils of this region are sandy and alkaline type. The presence of great phytodiversity proves the adaptability of these plants to such climatic and soil conditions, and these conditions are suitable for the growth and development of various plant species growing in this region.

- All the selected plant species are rich in nutritional and mineral values. These also have ascorbic acid (Vitamin C) and amino acid contents. So, these can be used as a good source of fodder for the livestock of this region.

- The studies of antimicrobial activities of selected plant species indicate that these definitely have some secondary products (like flavonoids) which have antibacterial and antifungal properties.
• The presence of flavonoids like quercetin and kaempferol in selected plant species indicate that these plants have antibacterial and antifungal properties.

• The immense medicinal value of these plant species shows that these can be utilized in drug and pharmaceutical industries.