CHAPTER – V

STUDY OF MINERAL CONTENTS
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The present investigation deals with study of mineral contents of roots, shoots, and fruits of *Abutilon indicum, Datura Stramonium, Withania somnifera* and *Tribulus terristris*.

**Materials and Methods**

The roots, shoots and fruits of all the four selected plant species taken for present investigation were collected from Palada pond area and Bherun nada area of kuchaman city, of Nagaur district.

Plant parts of *Abutilon indicum, Datura Stramonium, Withania somnifera* and *Tribulus terristris* were collected in polythene bags. The samples were dried powdered and then used for estimation of minerals i.e. Phosphorus, and Calcium.

**Estimation of calcium and Phosphorus**

For the estimation of Calcium and Phosphorus method given by Talpatra et al.,(1940) was followed. For the estimation of Calcium and Phosphorus 100 ml. of 50% Hydrochloric acid was added to the ash in crucible and contents were heated in waterbath for 10 minutes. The contents were transferred to 250 ml. beaker along with the washing till the crucible was free of acid. The contents were heated for 30 minutes and after cooling, filtered through ashless Whatman’s filter paper No. 42. The volume of filtered solution was made to 250 ml. with distilled water and kept as a stock solution for the estimation of Calcium and Phosphorus.

**Procedure for Calcium content estimation**

25 ml. of stock solution was taken in a beaker of 250 ml. 50 ml. of distilled water and 10 ml. of saturated ammonium oxalate was added. Two drops of alcoholic acid was also added. Acidity of solution was adjusted at the pH 4.6 by adding concentrated ammonia solution drop by drop till a brown coloured precipitate began to appear and then dilute ammonia solution was added till white coloured precipitate appeared.

The content of the beaker were kept overnight allowing the precipitate to settle down and on the next day the solution was filtered through Whatman filter paper number 40. The precipitate was washed several times with hot distilled water to remove excess oxalate. Precipitate was dissolved in 100 ml. distilled water and 10 ml. concentrated sulphuric acid. This solution was heated at 60-70°C for 30 minutes and
filtered against n/10 potassium permanganate solution. The filtration was carried out until a stable pink colour appeared.

The Calcium contents were calculated as follows:

\[
\text{Percentage of Calcium} = \frac{\text{Ml. of KMNO}_4 \times 0.002 \times 10 \times 100}{\text{Gm. Of sample taken for ashing}}
\]

Where 10 is the dilution factor.

**Procedure for Phosphorus content estimation**

Form the stock solution of acid soluble ash 25ml. aliquot was taken in 250ml. of a beaker in which 10ml. concentrated metric acid and 10ml. of freshly prepared saturated ammonium molybdate solution was added for precipitation. Yellow coloured precipitation of phosphor-ammonium-molybdate began to appear. The beaker was kept overnight allowing the precipitate to settle down. Next day supernatant was filtered through whatman filter paper number 42. The precipitate was sashed with 2% metric acid and then several times with 3% potassium nitrate solution for the removal of acid. The precipitate was dissolved in 20 ml. of N/7 sodium hydroxide and excess of sodium hydroxide was titrated against N/7 standard nitric acid solution phenolphalein was used as indicator. Phosphorus contents were calculated as follows:

\[
\text{Percentage phosphorus} = \frac{\text{ml.of N/7 NaOH} \times 10 \times 0.0001925}{\text{gm. Of sample taken for ashing}} \times 100
\]

Where, 10 is the dilution factor

**Estimation of Potassium and Sodium**

For the estimation of Potassium and Sodium content, method given by Bhargava and raghupathi (1993) was followed.

\[
\frac{100}{\text{Percent Potassium}} = \frac{R}{X} \times \frac{1}{10000} = R \frac{1}{100X}
\]
**Procedure for sodium content estimation**

1 gm. of ground plant material was taken in 100 ml volumetric flask and added 10 ml of diacid mixture of HNO$_3$ and HCLO$_4$ in 9:4 ratio. The flask was heated on heating device in a digestion chamber, first at low and then at higher temperature until the production of red NO$_2$ fumes ceases. The contents were further evaporated until the volume was reduced to about 3 to 5 ml. The completion of digestion was confirmed when the liquid became colourless. Cooled the flask and added double distilled water and made the volume upto mark and filtered the solution. A series of standards of 0, 2, 4, 6, 8, and 10 ppm Na was prepared by taking 0, 2, 4, 6, 8, and 10 ml of 100ppm Na solution in 100 ml flasks, respectively and made up their volume. The readings of standards were taken by flame photometer. Standard curve was prepared by plotting the concentration on x-axis and flame photometer readings on y-axis.

Readings of sample extract were also taken by flame photometer. The concentration of Na was found out from standard curve.

**Calculation**

Concentration of Sodium (ppm) = \( R \times \frac{\text{volume of extract prepared}}{X} = R \times \frac{100}{X} \)

Where, \( R \) = ppm Na in plant sample from standard curve.

\[
X = \text{weight of sam} = 1 \quad 1
\]

Concentration of Na in percent = \( \frac{R \times 100}{10000} = \frac{R}{100} \)

**Results and Discussion**

Concentration of the mineral contents in the various plant parts (roots, shoots and fruits) of all the selected plant species collected form two different sites i.e Palada pond area and Bherun nada area of kuchaman city, Nagaur district are presented in Table-5.1 to 5.4

Calcium content was found to be maximum (2.72%) in the roots of *Tribulus terristris* and minimum (0.71%) in the shoots of *Withania somnifera* collected from Palada pond area (Table-5.1)
Concentration of phosphorus was observed maximum (1.70%) in the fruits of *Datura Stramonium* collected from Palada pond area and minimum (0.51%) in the roots of *Withania somnifera* collected from Bherun nada area (Table – 5.2).

Maximum (0.27%) potassium content was found in the shoots of *Tribulus terristris* collected from Palada pond area while minimum (0.04%) in the roots of *Abutilon indicum* collected from Bherun nada area (Table – 5.3).

Sodium content was found to be maximum (0.80%) in the shoots of *Tribulus terristris* collected from bheru nada and minimum (0.12%) in roots of *Withania somnifera* collected from same area (Table - 5.4).

The mineral contents in various arid zone plants have been studied by Mathur, Karwasra, 1967; Purohit and Mathur, 1970; Nag et al. 1979; Harsh et al., 1980; Grover and Nag, 1984.

Sethia, Mathur, Singh and Nag (1987) reported 0.124% phosphorus in leaves of *Heliotropium marifolium* and 7.80% calcium in leaves of *Heliotropium rarifolium*.

Mathur, Kapoor and Nag (1988) reported mineral contents (Calcium and Phosphorus) in various plant parts of *Zaleya redimita, Glinas lotoides* and *Blepharis sindica*.

Kapoor, Mathur and Nag (1988) estimated the mineral contents (calcium and Phosphorus) in roots, shoots and fruits of *Aerva tomentosa*.

Kapoor, B.B.S. (1991) estimated Phosphorus and Calcium in different parts of *Fagonia cretica* and *Aerva tomentosa*.


Harsh, M.L. and Maheshwari, A (2000) observed calcium and phosphorus contents in some arid zone plants of Bikaner, Rajasthan.

Kapoor, B.B.S. and Ritu (2001) reported the calcium and phosphorus from leaves fo *Moringa oleifera, Pithecellobium duce* and *Pongamia pinnata*.

Maheshwari, A. (2001) estimated phosphorus and calcium in different parts of *Crotalaria burhia, Capparis decidua* and *Ziziphus mauritiana* in different seasons.
Shahid, A.(2002) reported the mineral status (Potassium and Calcium) in roots, shoots and fruits of *Acacia nilotica*, *Acacia senegal*, *Maytenus emarginata*, *Parkinsonia aculeate* and *Prosopis cineraria*.

On the basis of above findings it can be concluded that all the selected plant species growing in kuchaman city area of Nagaur district can be a good source of feed and fodder for the livestock.
TABLE-5.1

Calcium contents of various plant parts of selected plant species

(Percentage on dry matter basis)

<table>
<thead>
<tr>
<th>Plants</th>
<th>Root</th>
<th>Shoot</th>
<th>Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>Abutilon indicum</td>
<td>1.56</td>
<td>1.15</td>
<td>2.15</td>
</tr>
<tr>
<td>Datura stramonium</td>
<td>1.20</td>
<td>1.20</td>
<td>1.50</td>
</tr>
<tr>
<td>Withania somnifera</td>
<td>1.49</td>
<td>1.70</td>
<td>0.71</td>
</tr>
<tr>
<td>Tribulus terristris</td>
<td>2.72</td>
<td>2.30</td>
<td>2.00</td>
</tr>
</tbody>
</table>

I-Palada pond area   II- Bherun nada area
TABLE-5.2

Phosphorus contents of various plant parts of selected plant species
(Percentage on dry matter basis)

<table>
<thead>
<tr>
<th>Plants</th>
<th>Root</th>
<th>Shoot</th>
<th>Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>Abutilon indicum</td>
<td>0.96</td>
<td>0.90</td>
<td>0.97</td>
</tr>
<tr>
<td>Datura stramonium</td>
<td>1.13</td>
<td>1.50</td>
<td>1.76</td>
</tr>
<tr>
<td>Withania somnifera</td>
<td>0.57</td>
<td>0.51</td>
<td>0.77</td>
</tr>
<tr>
<td>Tribulus terristris</td>
<td>1.06</td>
<td>1.40</td>
<td>0.76</td>
</tr>
</tbody>
</table>

I- Palada pond area     II- Bherun nada area
TABLE-5.3

Potassium contents of various plant parts of selected plant species

(Percentage on dry matter basis)

<table>
<thead>
<tr>
<th>Plants</th>
<th>Root</th>
<th>Shoot</th>
<th>Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>Abutilon indicum</td>
<td>0.06</td>
<td>0.04</td>
<td>0.20</td>
</tr>
<tr>
<td>Datura stramonium</td>
<td>0.12</td>
<td>0.15</td>
<td>0.13</td>
</tr>
<tr>
<td>Withania somnifera</td>
<td>0.08</td>
<td>0.11</td>
<td>0.12</td>
</tr>
<tr>
<td>Tribulus terristris</td>
<td>0.06</td>
<td>0.08</td>
<td>0.27</td>
</tr>
</tbody>
</table>

I- Palada pond area  
II- Bherun nada area
TABLE-5.4

Sodium contents of various plant parts of selected plant species
(Percentage on dry matter basis)

<table>
<thead>
<tr>
<th>Plants</th>
<th>Root</th>
<th>Shoot</th>
<th>Fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>I</td>
</tr>
<tr>
<td>Abutilon indicum</td>
<td>0.54</td>
<td>0.78</td>
<td>0.25</td>
</tr>
<tr>
<td>Datura stramonium</td>
<td>0.25</td>
<td>0.53</td>
<td>0.19</td>
</tr>
<tr>
<td>Withania somnifera</td>
<td>0.20</td>
<td>0.12</td>
<td>0.44</td>
</tr>
<tr>
<td>Tribulus terrestris</td>
<td>0.75</td>
<td>0.30</td>
<td>0.54</td>
</tr>
</tbody>
</table>

I- Palada pond area        II- Bherun nada area