CHAPTER II

MATERIALS AND GENERAL METHODS
CHAPTER II

MATERIALS AND GENERAL METHODS

Early references to the plant Kasar - Later references to the plant - Identification of the material and taxonomical status - Description of the plant and part used - General methods - Botanical, Chemical and Pharmacological investigations.

Early references to the plant Kasar:

The earliest reference to the plant 'Uccata' (1) appears in the Kamasutra of Vatsayana, which is usually dated about 300 B.C. The author mentions the plant in the 7th Adhikarana of the text, which is entitled 'Vrushayoga'. It is stated that the plant with Glycerina glabra (ग्रीमीग्लाब्रा), drunk with milk and sugar results in good strength and virility.

उपायकृतम् भाष्यमूले प्रक्षकरण परमात
पीला दृष्ट ऐति ॥ ३२॥
कामसूत्रम् हर्षायणः आदित्य ६, ९८॥
Caraka has referred to the plant in about five places. (2)
The first reference mentions the plant as a 'tonic' and 'astringent' and that it has 'Sheeta' (शीत) properties. (3)
The second reference again mentions this plant in combination with others for the development of 'Shukra' (शुक्र) and also 'Mausa' (मांस). The other references are concerned with preparations of the plant with other plants useful as nasal drops, enemas etc.

Susruta, the second important author of Ayurveda, describes the use of the tuber of this plant along with *Asparagus* and *Mucuna* as a very important preparation in the promotion of 'strength' and 'virility' in man. He includes this under the class of plants (4)

with 'Rasa' known as 'Madhura' (मधुर) in Ayurveda.

Sanskrit: शुक्रसारंक प्रमुखम्: ते नाहिक इंग्लेसे: साधुदिना कस्टेक्क शुक्रा-नासिकाः नेत्रेया अग्नि:

शुक्राः मात्रास्य स्वतः स्वपितः कातर्कः

तस्य नाशास्त्री अमालाक्षके रक्तगुम्

शुक्र-गामिकाप्रेमाः तस्मार गृहु विशामे शीताः

-परिशासन, सूरस्वामन 20/196

* Sheeta - cooling.
** Shukra - reproductive germ-plasm of male and female.
*** Mausa - flesh.
**** Madhura Rasa - it is supposed to give tone to tissues and support the body.
The next author is Vagbhata, who is supposed to have lived in the 4th century A.D. This author not only mentions that the plant is 'Sheeta' (शीता), 'Madhura' (मधुर), and 'Urah' (उराह), but also mentions that the preparation of the plant material may be fruitfully administered to pregnant women for the successful maintenance of pregnancy. Another reference from the same author clearly mentions that the preparation of the plant may be given continuously, particularly after the seventh month of pregnancy, where there is a fear of abortion.

* Grahi = astringent.
This reference is very important since, it is a clear departure from the previous references. The earlier authors mentioned only properties imparting strength and virility but Vagbhata for the first time described its use in threatened abortions. All the authors however, are unanimous in their opinion as regards the 'Sheeta' (शीत) property of the plant. The other minor references in Vagbhata mention the use of the plant in other diseases of heart and kidney, in which 'Sheeta' (शीत) property is required. Vagbhata in 'Uttarsthana' described the use of the plant material particularly in 'female infertility' and 'Dosha' (दोष) of the reproductive system in both male and female.

The next author ज्यावप्रकास, who is supposed to belong to about sixteenth century A.D. follows Vagbhata in most of the details as regards treatment of pregnancy by this drug. The plant is believed to prevent the pains in later months of pregnancy and also abortions.

* Dosha - a complete concept in Ayurveda of the responding living systems in both health and diseases.
It will thus be seen that the earlier authors of Ayurveda point out the possibility of the use of this plant material in certain specific directions in the 'promotion of health' such as 'virility' and later authors from Vagbhata onwards indicate the more exact use of the material in the 'preventions of threatened abortions', for stopping the 'unnecessary pains in the later months of pregnancy' (possibly caused by uterine contractions) and to 'cure diarrhoea'.

The plant Kaseru is mentioned by Bhavaprakasa in two varieties. The term 'Kaserukdvyam' is used by author for two varieties of tubers. One of them is termed as 'Mahat-raja-Kaseruka' (महतराजकसरुक) and the other as 'Chichod' (चिचोड). The former is bigger in size and the latter is comparatively small and is said to resemble the shape of a 'testicle'. Properties of both these types of Kaseru are the same as mentioned by the author. Rajanighantu also mentions the variety 'Rajakaseru'. The other synonym of this variety is 'Kacchrhuha' (कच्छ्रुहा), which indicates that the plant occurs in 'Kaccha' and other sandy parts. The other variety is mentioned by Rajanighantu as 'Mustha' and is described as 'growing near water'. The same is
described by Bhavaprakasa as 'Mustakrut' and 'Laghu' means small. Thus after the period of Bhavaprakasa both the varieties were well known to Indian authors.

Later references to the plant :-

(14)
Watt mentions the plant under the botanical name Scirpus kyangor Roxb., which is supposed to be common on the banks of lakes and rivers throughout India. It is known that native practitioners use the tubers in conditions of diarrhoea and vomiting. An interesting use mentioned about the drug is that it can remove the taste of medicine in the mouth.

(15)
Dymock (1893) refers to two types of edible tubers, one of them is called 'Thegi' and is supposed to grow in the sandy coast of 'Kathiawar'. It was used very much as a food material during famine. The other tuber is called 'Pudnya' in Marathi. It grows in rice fields. Dymock presents the general analysis of two tubers, which does not show much difference in the major constituents like fat, carbohydrate and protein. Kirtikar (1886) has published a note on this plant, which is also referred to in 'The Flora of Bombay' by Dalzell and Gibson. According to him the bulbs, which are available in plenty round about Thana, are gathered from January to
March. The bulb is hairy with rootlets of 2" to 3" long. The plant is annual in nature and flowers in July and August. In addition to its being a food delicacy, it is said to be useful in diarrhoea and vomiting. The same author (1918) mentions an additional property of the tuber as being valuable in removing the bad taste of medicine from mouth. Desai (1927) mentions two varieties of this tuber, one 'Thegi' occurring in Kathiawar and other called 'Pudhya' found in Konkan. Nadkarni describes two types of tubers again with a property of usefulness in diarrhoea and vomiting. The tubers are administered usually with milk. Wealth of India describes the uses of other parts of the plant in addition to tubers.

Identification of the material and taxonomic status:

It appears from the literature that Roxburgh was the first author, who equated the plant Kaseru with *Scirpus kysor*. It seems that Roxburgh has described the plant as early as 1814. Dalzell and Gibson (1861) in the *Flora of Bombay Presidency* describe the plant 'Scirpus kysor', but do not mention the Bengali name 'Kesoor' for *Scirpus kysor* of which the vernacular name in Marathi is 'Kaseru'. Since the author describes the
occurrence of the plant in Bengal on the border of tanks and lakes in fresh water, it is natural that he gives Bengali vernacular name 'Kesoor' and not the Marathi vernacular name 'Kaseru'. Clarke (1894), while describing 'the Flora of British India' mentions Scirpus kysoor without mentioning the vernacular name 'Kaseru'.

Cooke (1906) does mention the vernacular name 'Kachara' for Scirpus kysoor, which is the name in the local dialect in Monkan, where the plant occurs in the beds of the rivers and ponds. Sedgwick reviews the natural order Cyperaceae of Bombay Presidency and mentions the species Scirpus kysoor with its morphology and does not give any vernacular name.

It will thus be seen that the plant Kaseru in vernacular has been long identified as 'Scirpus kysoor Roxb.' by a number of eminent authors. (Plate No.1).

The natural order Cyperaceae to which the plant Scirpus kysoor belongs, is wildly distributed throughout the world with sixty-five genera and three thousand species. In India, this natural order comprises of fifteen genera and about three hundred sixty species. The family is generally characterised by fibrous roots, sometimes tuberous and other specific morphological
characteristics of flowers and leaves. One of the genus *Scirpus* of this natural order contains about 200 species, distributed throughout the world. Only twenty-seven species occur in India, and the occurrence of *Scirpus kysoor* is particularly noted in Konkan, Gujarat and Bengal.

The taxonomic status of the plant does not seem to have changed since the first botanical identification in India by Roxburgh. Dalzell and Gibson (1861) consider *Scirpus kysoor* as allied to *Scirpus grossus* in the catalogue of plants - 'Indigenous to Western India in Bombay Presidency'. But Sedgwick (1918) has noted that he has not seen any true sheet of *Scirpus grossus* in the available material anywhere. Hence, *Scirpus grossus*, which may show a slight morphological variation from *Scirpus kysoor* can be taken as its synonym and not as a separate species.

Some authors such as Dymock and Desai have referred to two types of tubers as 'Thegi' and 'Pudhya', similar to Rajanighantu and Bhavaprakasa. Dymock for the first time botanically identified them as *Cyperus bulbosus* and *Scirpus kysoor* respectively. The later authors have also confirmed the same botanical identification of these two
types. It needs to be mentioned here that the taxonomic status of both these species *Cyperus bulbosus* and *Scirpus kusoor* have not changed so far. They differ in their macroscopic appearances and habitats. One of them occurs in sandy deserts of Sindh, Kathaiwar and Rajasthan, while the other, in Konkan, Bengal and Gujarat. It is interesting to note that both the types of tubers are edible in nature and serve as food in famine periods chiefly for the local population.

The material used in the present study is a tuber of *Scirpus kusoor* which is consumed as food and also used in medicine. The botanical description of the material used in the study with its synonyms, regional names, habitat, stem, leaf, description of inflorescence etc. are given below.

**Description of the plant and part used**

1. **Botanical Identification**: *Scirpus kusoor* Roxb.
   - N.O. - Cyperaceae.

2. **Synonyms** (As per classical texts)
   - (1) (2) (3)
   - Uccata, Kasheruk, Kaseruka.

**Regional Names**

- Bombay - Kasuru; Bengali - Kesoor; Gujarathi - Gundaro;
- Hind-Kasuru,Kaseru; Marathi - Kachera,Kasara,Kaseru;
Oriya - Santara; Punjabi - Kasere, Dila; Sindhi - Dhanyada; Tamil - Gunda, Tunga Gaddi and Telgu - Gunda tinga gaddi.

3. **Habitat** :-

A large perennial glabrous herb or weed distributed throughout India, especially along coastal areas on the margins of the tanks, river beds and sometimes cultivated in Bengal, Bihar, Madras and Maharashtra.

An erect, robust, perennial herb.

4. **Leaves** :-

Several to each stem and about as long as the stems 1 cm. to 2 cm. wide linear, acuminate, the margin and keel somewhat hispid when young.

5. **Stem** :-

100-150 cms. high, 2-3 cms. thick, triquetrous with concave sides and smooth angles, acuminate, coriaceous with smooth or scaberulous margins, sheaths long and open.

6. **Inflorescence** :-

Decompound umbel, large terminal corymbiform compact to open usually with spreading rays of variable length. Involucral bracts 3, leaflike, broad at the base flat linear, acuminate, **Spikelets** sessile or pedicellate, subglobosely ovoid, dark, reddish brown, **Glumes** - loosely imbricate, elliptic, 2-lobes basically obtuse, reddish brown
membranous, strongly keeled, 3-nerved, mucronate.

Hypogynous bristles 5-6, stamens 3, anthers linear, apiculate. Ovary compressed, style 1-2 mm. long with dialated bulbous base, stigmas 3 as long as the style.

7. **Fruit** :-

1.8 to 2.0 cms. by 0.9 to 1 cms. obovoid, broadest at the shoulders, tapering towards the base, angles sub-acute, sides sub-equal, plain or slightly convex.

General surface, dark yellow to reddish brown, bearing longitudinal striations of fine ridges alternating with very five furrows, basal surface usually covered with glossy tomentum.

8. **Flowering and Fruiting** :-

Flowering - July to September, Fruiting - October to December.

9. **Ecology** :-

Common in monsoon pools, in mud along the boundaries of tanks. It flourishes in sticky soils. The plant propagates by stolons, which bear tubers measuring about 2.5 cm. in diameter.

**Part used - Tuberous roots** :-

Tuberous roots are about the size of nutmeg, varying 1.2 - 2 cm. in diameter, 1.6 - 2.4 cm. in length,
cylindrical, oblong, knotty and tough in dry as well as in fresh condition. Colour black to brown, covered with erect straight or matted hairs much longer along with fibrous and stoloniferous adventitious roots. 

**General methods :-**

The broad general methods of botanical, chemical and pharmacological investigations are presented here, while the details of these investigations are included in the respective chapters, so that it will be convenient to follow the data and results.

(A) **Botanical investigations :-**

The botanical investigations include:

(i) Macroscopic examination.
(ii) Microscopic examination.
(iii) Microchemical tests.
(iv) Analysis of the powdered drug.
(v) Quantitative microscopy.

(B) **Chemical investigations :-**

The chemical investigations include:

(i) Extractives.
(ii) Ash and acid-insoluble-ash.
(iii) Phytochemical tests for alkaloids, sugars, glycosides, tannins and saponins.
The Liebermann Burchard, Keller-Kiallani and Salknovaski reactions were carried out for the detection of steroids.

(iv) Based on phytochemical testing and the attributed anti-abortifacient property, the specific bioassay for antioxytocic activity of the extract was carried out on the rat uterus according to Turner, with the extracts prepared by successive solvent extraction. Further separation of the extracts were carried out by column chromatography based on TLC studies and antioxytocic activity on rat uterus.

The active crystalline compound was characterized by micro-analysis and mass, NMR, IR and UV spectra of the compound. The confirmation of the compound was done by superimposition of IR spectra.

Pharmacological investigations:

The general pharmacological investigations include:

1. Acute toxicity study in mice.
2. General behavioural study in rats.
3. CNS activity:
   a. Spontaneous motor activity.
   b. Pentobarbitone sleeping time.
(c) Anti-convulsant activity.

(iv) Special tests:

(a) Analgesic

(b) Anti-inflammatory

(c) Anabolic

(v) Effect on Dog B.P., respiration.

The details and references of these methods are given in the respective chapters.
<table>
<thead>
<tr>
<th>References</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vatsayana</td>
<td>Kamasutra, Pandit Madhavacharya (1934) Adhikaran-7, Adhyaya 1, Stanza 35.</td>
</tr>
<tr>
<td>5. - Ibid -</td>
<td>Sutrasthana, Adhyaya 42, Stanza 11.</td>
</tr>
<tr>
<td>10. - Ibid -</td>
<td>Uttarasthana, Adhyaya 24, Stanza 53.</td>
</tr>
<tr>
<td>No.</td>
<td>Author/Title</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>15.</td>
<td>Dymock, W.</td>
</tr>
<tr>
<td>21.</td>
<td>Roxburgh, W.</td>
</tr>
</tbody>
</table>
23. Clarke, C. B. 


24. Cooke, T. 


25. Sedgwick, L. J. 


26. Hooker & Jackson 


27. Turner, R. A. 


***