



## Morphological Analysis of two Indian herbal-drugs **Borivilianum and Asparagus**

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### Abstract :

Two species, namely *C. borivillianum* and *C. tuberosum*, hold an important position in the Indian materia medica as integral components in herbal-drug prescriptions against general debility.

However, *C. borivilianum* is an important medicinal herb. It is also known as Safed Musli, and a member of special class of herbs known as ‘Rasayana’ and it falls into a special class of

Rasayana known as ‘Vajikarana’ i.e. Aphrodisiacs (Marais & Reilly, 1978). Safed Musli (*C. borivilianum*) belongs to the family Liliaceae and is probably christened so because of the white milky texture of its tubers after peeling.

**Chlorophytum borivilianum** is a small perennial herb with a full crown of radical leaves appearing over the ground with the advent of summer rain. Its root tubers are fleshy, fascicled and directly originate from the stem disc devoid of any fibrous structure. They are cylindrical and 5 - 20 in number. Flowers of *Chlorophytum* are small, white, bracteate, pedicillate, zygomorphic, usually arranged in alternate clusters, each cluster comprising of 3 flowers. The flower clusters are dense on the upper part of the scape; bracts are linear, papery and purplish, 1.0 -10.5 cms long; pedicle whitish and 6 -10 mm long. It bears green to yellow colored fruit which is almost equal in length and breadth. Seeds are endospermic, onion-like, black colored and angular in shape.

**Asparagus racemosus (A. racemosus)** belongs to family Liliaceae and commonly known as Satawar, Satamuli, Satavari found at low altitudes throughout India. The dried roots of the plant are used as drug. The roots are said to be tonic and diuretic and galactagogue, the drug has ulcer healing effect probably via strengthening the mucosal resistance or cytoprotection. It has also been identified as one of the drugs to control the symptoms of AIDS. *A. racemosus* has also been

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successfully by some Ayurvedic practitioner for nervous disorder, inflammation and certain infectious disease. However, no scientific proof justify abovementioned uses of root extract of *A. racemosus* is available so far.

## Morphological Analysis of *Borivilianum* and *Asparagus*

### 1 Leaf numbers, length and width

**Borivilianum** : There were significant differences among genotypes for leaves numbers per plant, leaf length and leaf width. Genotype CCS-5 showed higher number of leaves per plant while CCS-1 contained lower number of the same. On the other hand, CCS-1 contained lower number of leaves per plant. Same pattern was also observed in case of leaf length and leaf width (Figure 3) as CCS-5 showed comparatively longer leaves with an average length of 28.8 cm and wider leaves with average size of 1.73 cm, while observation with CCS-1 were 18.30 and 1.21 cm respectively (Table 8). Furthermore, in all genotypes leaves were found to be spirally imbricate at the base, sessile in nature, linear or ovate with acute apex and slightly narrowed at the base, spreaded horizontally, with smooth surfaces, wavy margins and parallel venation.

**Asparagus** : Roots pale brown to white colour with characteristic odour and are tasteless in nature. Root tubers are fleshy, fascicled and directly originate from the stem disc devoid of any fibrous structure and distinguished it from other species of Chlorophytum genus. The shape of tubers were cylindrical, the thickness being on the average 0.9 cm and the length 8cm. The number of tubers varies from plant to plant and on an average 5-30 tubers/ plant are observed and slightly tapering towards lower side look like pestle. It has 6 -13 radical leaves spirally imbricate at the base, sessile in nature, lanceolate and linear or ovate with acute apex and slightly narrowed at the base and less than 30cm long. The leaves spread horizontally, with smooth surfaces, wavy margins and parallel venation.

### 2. Tuber yield

A significant difference in fresh weight of tuber was observed among different genotypes (Figure 4). Genotype CCS-2 was found to be superior in tuber yield as in this genotype an average of 65.51 g per plant tubers noticed. On the other side, CCS-4 showed lower tuber yield i.e. 32.34.

Table 1. Leaves numbers, length and width of different genotypes of *C. borivilianum*. Each figure is mean of three independent replicates.



S. No.	Genotype	Average leaves number/plant	Leaf length (cm)	Leaf width(cm)
1.	CCS-1	16.76±1.5	18.32±0.8	1.21±0.09
2.	CCS-2	23.82±2.0	26.73±1.2	1.72±0.82
3.	CCS-3	20.65±1.6	24.25±1.2	1.61±0.10
4.	CCS-4	18.22±1.6	20.23±1.8	1.32±0.07
5.	CCS-5	24.30±2.2	28.85±1.9	1.73±0.11



6.	CCS-6	19.41±1.5	20.24±1.6	1.51±0.09
7.	CCS-7	19.62±1.6	21.44±0.9	1.32±0.07

**Asparagus** : The plant form of *Asparagus adscendens* is a shrub of struggling nature much branched, spines with woody stem, It can grow up to an utmost height of 1.5 feet. Cladodes are 0.6-1.2 cm long linear in shape but stout, straight, bear spines (Figure 1). Flowers are small, white, 3-4 cm across, solitary or fascicled with copious racemes. Fruits are 0.8 cm in diameter, globes, 3 lobed berries with only one seed . Tubers can grow up to a depth of 10 inch. *Asparagus* is a sub-erect prickly shrub with white tuberous root that grows well in tropical and sub-tropical climates with heights up to 1,500 meters. *Asparagus adscendens* is usually found throughout India and Himalayan Mountain ranges. Naturally occurs in forests of western Himalaya, Gujarat, Madhya Pradesh and Maharashtra States that are listed in the endangered species of India. A.



racemosus is a woody climber growing to 1-2 m in height. The leaves are like pine needles, small and uniform and flowers are white and have small spikes. This plant belongs to the genus *Asparagus* which has recently moved from the sub family *Asparagae* in the family *Liliaceae* to a newly created family

#### 4.2.1. Chromosomal complements

The cytological study in 7 genotypes of *C. borivilianum* was conducted in detail for somatic chromosome number. All the genotypes collected from various locations showed  $2n=28$  chromosomes (Figures 5-8) which were resolved into 7 distinct groups, each comprising 4 homologous chromosomes. These groups formed a discrete series from the longest to shortest pair within complement. The accession wise details are as follows:

CCS-1: This accession was cytologically characterized into 7 groups of chromosomes, each comprising 4 chromosomes. Barring 2 chromosomes belonging to 6th group, all the chromosomes in the complement were observed as submetacentrics. The 5th group of chromosomes was found to be nucleolar in nature. The karyotype was resolved into  $2V+24L+2Ln$ . The largest chromosome in the complement was about 1.98 times larger than the shortest chromosome in the complement (Fig.5a).

CCS-2: The unique feature of this accession was that all the 28 chromosomes were submetacentric and the 5th group was nucleolar in nature (Fig.5b). The longest chromosome was 1.9 times longer than the shortest in the complement. The karyotypic formula was resolved into  $26L+2Ln$ .

CCS-3: In this accession all the chromosomes belonging to 5 groups were submetacentric in nature. However, in the remaining 2 groups 2 chromosomes were submetacentric while the remaining were either subtelocentric (3rd group) or metacentric (6th group). There were no nucleolar chromosomes in this accession. Longest chromosome was 2 times larger than the smallest in the complement (Fig.6a). The karyotype was resolved into  $2V+24L+2J$ .

CCS-4: All the 28 chromosomes belonging to 7 groups of this accession were submetacentric in nature and as in case of CCS-1 and CCS-2, the 5th group comprised of a pair of nucleolar chromosomes (Fig.6b). The largest chromosome was 1.90 times larger than the smallest chromosome in the complement. The karyotypic formula was resolved into  $26L+2Ln$ .



CCS-5: Four out of 7 groups of chromosome complement of this accession were submetacentric in nature. The remaining of 3 groups had either telocentric (2nd group) or metacentric (3rd and 6th groups) chromosomes in pairs (Fig.7a). The largest chromosome was more than 2.3 times larger than the smallest chromosome in the complement. The karyotypic formula was resolved into  $4V+20L+2Ln+2J$ .

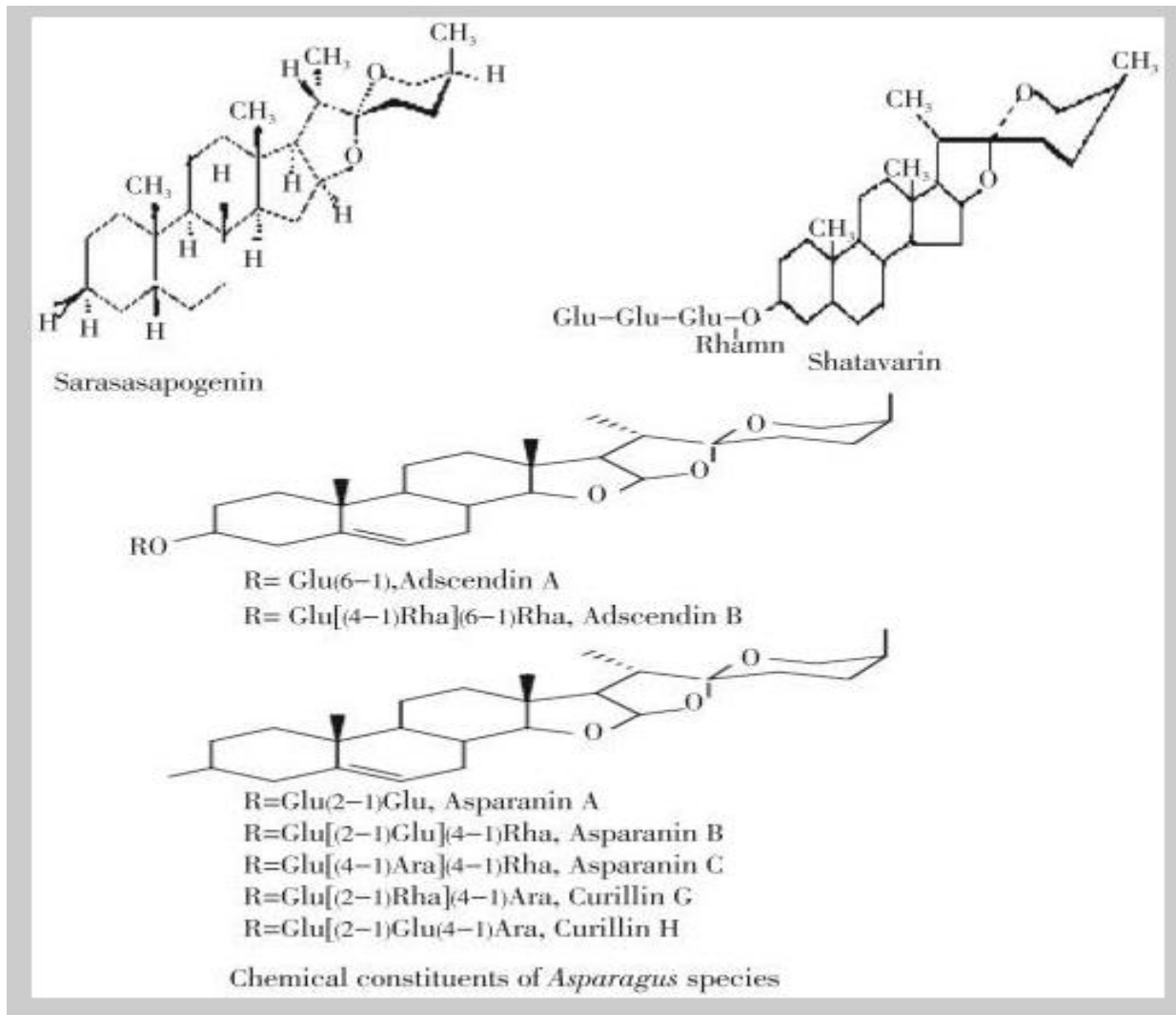
CCS-6: This accession was characterized by the presence of submetacentric chromosomes only. Any other morphological type or marker chromosomes (nucleolar) were not observed (Fig.7b). The largest chromosome was roughly 2.9 times larger than the smallest one. Karyotypic formula was simply recorded as 28L.

CCS-7: This accession had karyotypic resemblance with that of CCS-5 in having metacentric and submetacentric chromosomes in the complement. Five out of 7 groups were submetacentric, one group (3rd) was characteristically telocentric (I) in nature, 2 chromosomes of 5th group were

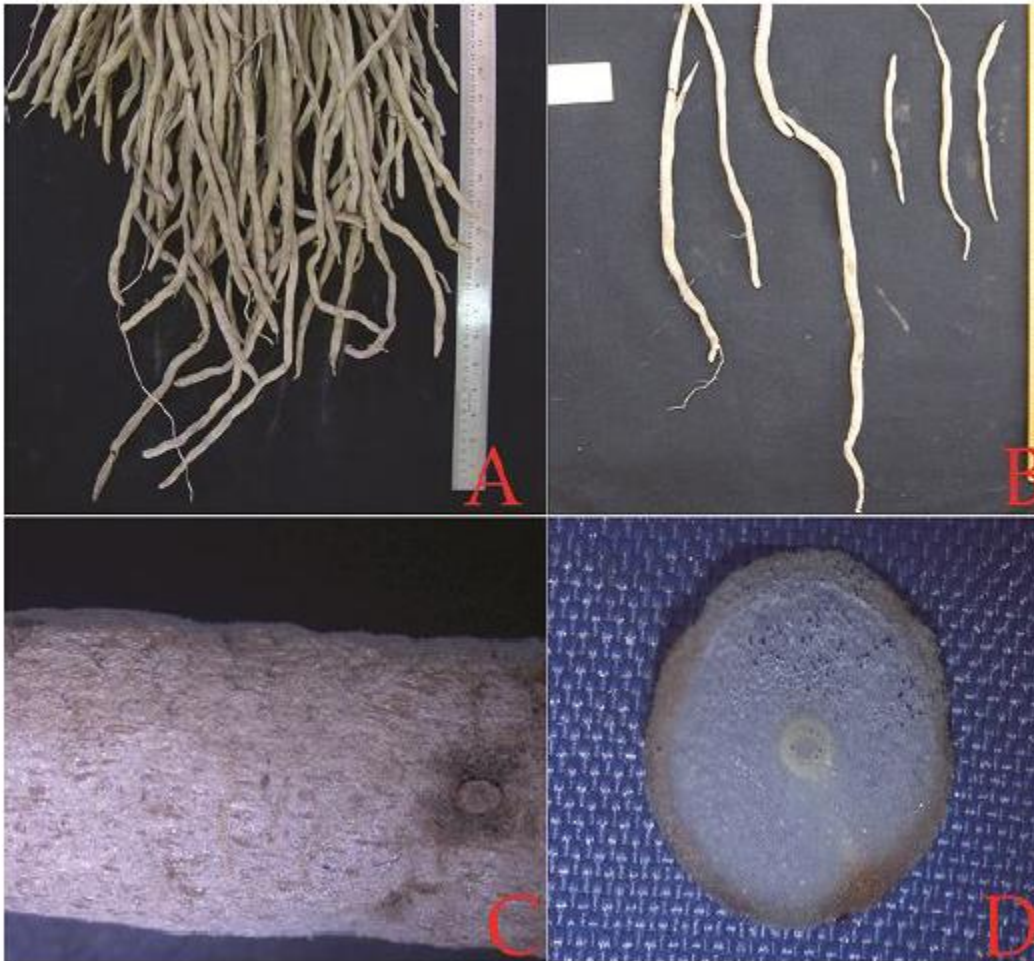


metacentric in nature and also possessed a secondary constriction showing the nucleolar nature

(Fig.8). The length of longest chromosome in the complement was 2 times that of shortest chromosome. The karyotypic formula was resolved into  $2Vn+22L+4I$ .







**morphological features of tuberous roots A. Whole root system of well grown plant, B. variations in root length C. Close up view surface of roots D. Whole mount TS of root**

The tuberous roots are 30 – 100 cm long, 0.7 – 1.5 cm diameter (Fig 1d), odourless, cylindrical with slightly tapering ends and sweetish in taste. Older tubers were dark brown whereas young tubers pale yellow in colour. Scars and protuberances of lateral rootlets were seen all over the outer surface with longitudinal wrinkles. Texture was hard and roots breaks with uneven fibrous fracture when dried. Irregular longitudinal furrows developed when root was peeled and dried.

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