SUMMARY

Phytochemical screening of twenty one wild taxa of *Dioscorea* (including species and varieties) was done in present study. The tubers of taxa investigated were examined for the concentration of five chemical components - diosgenin, protein, starch, calcium, and phosphorous - which are supposed to be the main constituents in tubers of yams.

Diosgenin is a steroid common in *Dioscorea* species. This chemical substance is used as precursor for the commercial production of various corticosteroids, sex hormones and antifertility compounds. Yams are considered to be rich sources of diosgenin. The concentration of diosgenin varies with species of *Dioscorea*. *Dioscorea composita, D. mexicana, D. deltoidea, D. floribunda* and *D. prazeri* are cultivated for the industrial extraction of diosgenin used in pharmaceutics. Corticosteroids which include cortisone, hydrocortisone, male and female sex hormones like Testosterone, Estradiol, estrone and progesterone are produced from diosgenin. Female hormones are used as antifertility principles in oral contraceptives.

Diosgenin concentration in wild species examined in the present study is relatively low in comparison with commercial species of *Dioscorea*. Commercial species and varieties of *Dioscorea* have diosgenin content of 2 – 8% on dry weight basis (Kunjithapadam, 1977). Wild plants examined in the present study have 0.2 mg/gm to 6.5 mg/gm of diosgenin content in dry tubers. This is a very low range for diosgenin when compared with commercial species and varieties of *Dioscorea* grown for extraction of the same. Highest concentration of 6.5 mg/gm of diosgenin was found in *D. atropurpurea*. This species is at present a wild one though once it was cultivated for the bulbils which formed the edible portion.

No relation between diosgenin content and chromosome counts or ploidy levels of the taxa analyzed was found in the present study. Neither a relationship between base numbers and concentration of diosgenin was present in the taxa analyzed.
Total protein content of dried tubers of the taxa examined varied between 10.2 mg/gm and 35 mg/gm. Minimum value of 10.2 mg/gm was represented in *Dioscorea bulbifera*, var. sativa and the highest concentration of 35 mg/gm was found in *D. bulbifera*, var. C. Of the twenty one taxa analyzed, maximum variation in protein content was observed in the species *D. bulbifera*. The three related varieties of *D. bulbifera*: namely *D. bulbifera*, var. A, *D. bulbifera*, var. B and *D. bulbifera*, var. C differed very much in the concentration of protein with corresponding values of 12 mg/gm, 15 mg/gm and 35 mg/gm. These concentrations themselves show that synthesis of protein is independent of the chromosome counts of the taxa concerned. Protein concentration of 30.6 mg/gm in *D. bulbifera*, var. vera, and 10.2 mg/gm in *D. bulbifera*, var. sativa clearly shows that protein synthesis is independent of the ploidy of taxa examined. No correlation was found between the basic chromosome number of taxa and protein production in members examined.

Starch is the main component of cultivated species and varieties of *Dioscorea*. Most of the wild taxa analyzed showed high concentrations of starch like cultivated yams. Concentrations above 60 mg/gm on dry weight basis were observed in six taxa analyzed. Lowest concentration of 26 mg/gm was found in *Dioscorea oppositifolia*, var Linnaei, *D. tomentosa, D. wallichii and D. bulbifera*, var. vera. Highest concentration of starch, 72 mg/gm, was found in *D. bulbifera*, var. B and *D. alata*, var. white. Related taxa with identical chromosome counts showed variation in starch concentration.

*D. bulbifera*, var. A, *D. bulbifera*, var. B and *D. bulbifera*, var. C recorded starch concentration of 33 mg/gm, 72 mg/gm, and 65 mg/gm respectively. *Dioscorea oppositifolia*, var. Linnaei is a pentaploid which has starch content of 26 mg/gm while the hexaploid variety

*D. oppositifolia*, var. dukhunensis has starch content of 71 mg/gm. These observations indicate that synthesis of carbohydrates in wild yams is independent of the chromosome counts, ploidy and basic chromosome number.
Calcium in the form of calcium oxalate crystals are found within the cells of wild yams. They exist in the form of needles which are bundled together. Total calcium concentration in taxa analyzed recorded a low of 4.5 mg/gm in *Dioscorea bulbifera* var. A. Maximum calcium content of 12.5 mg/gm was found in *D. bulbifera*, var. C. Presence of these extreme values within related varieties of the same species with same chromosome count shows that chromosome counts are not indicative of the quantity of calcium produced. Close observation of the concentrations of calcium in different taxa analyzed proves randomness in the production of calcium irrespective of the chromosome counts, ploidy and basic chromosome numbers of the plants analyzed. As a whole, the concentration of calcium is very high in wild forms of *Dioscorea* in relation to cultivated forms. The usual concentration of 3 – 4 mg/gm is common in cultivated forms while the lowest concentration recorded in the present study of wild yams is 4.5mg/gm. It seems that the concentration of calcium oxalate crystals has a direct relation to the edibility and food value of the tubers of yams.

The quantity of phosphorous yield by dried tubers of different taxa examined falls within the range 2.5 mg/gm – 7.1 mg/gm. *Dioscorea oppositifolia*, var. Linnaei has the maximum concentration of 7.1mg/gm and *D. spinosa* the minimum concentration of 2.5 mg/gm of phosphorous. No correlation exists between varieties or species with respect to phosphorous concentration.

Chemical analysis of the twenty one taxa of wild *Dioscorea* revealed results which were far from expectations. In normal quantitative inheritance, the quantity of material produced by an organism is controlled by the number of chromosome multiples present in the genome. The concentration of the material synthesized is therefore influenced by variation in chromosome counts and level of ploidy of the karyotype. Analysis pertaining to all the five chemical components – diosgenin, protein, starch, calcium, and phosphorous – of the twenty one taxa belonging to the genus *Dioscorea*, showed no correlation between chromosome counts or level of ploidy and the synthesis and accumulation of the chemical components in them. Similar observations were obtained by Essad (1984) in an analysis of *D. transversa* Brown, *D. pilosiuscula* Bert, and
D. trifida L. in which no relation was found between polyploid variation and food value among the species and varieties analyzed. Analysis of 80 cultivated accessions of Dioscorea trifida, using flow cytometric methods, showed no significant variation in 2C DNA content among them (Mustapha, et al., 2006). These observations, coupled with the results obtained in present investigations indicate the involvement of differential amplification of species specific repetitive sequences or retro transposons in chromosome counts and polyploidy among various taxa of the genus Dioscorea.