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Research Article

The Virginia State University Herbarium (VSUH)

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Abstract

The chesterfield county and tri-cities (Colonial Heights, Hopewell and Petersburg) of Virginia are rich in floristic elements due to their location and soil type. Moreover, the flora has been studied to such a small extent that is still lying as blank spot in the county distribution maps. These areas are now facing urbanization due to increase in population and local industries that needs immediate attention as there will be a severe loss of biodiversity. The publications available are check lists of plant species in the chesterfield area in 1970's. The current exploration by Virginia State University (VSU) aims to collect the flora, classify them into families according to Bentham and Hooker system of classification and Naming of plants as per the International Code of Botanical Nomenclature (ICBN). The measurement of the morphological characters following the artificial dichotomous keys for genera and species. The current activity in the department also involves the fingerprinting of herbarium specimens for future research needs. This forms a valuable addition to the existing flora at the department and the knowledge of the flora of the state Virginia. For this reason, a floristic survey of these areas reinitiated in April 2008 at Department of Biology, VSU by the authors is presented.

Keywords: Digitization; Exploration; Native Plants; Identification; Botanical Description; Biodiversity

Introduction

The floristic information available for the current study area and also nearby counties [1,2] in the state of Virginia were carefully reviewed by the authors and found that floristic work of Colonial Heights, Petersburg and Hopewell cities is unexplored and no previous countywide floristic inventory exists. However, there is chesterfield county's exploration data from 1970's available as check lists in the available public literature [3,4]. There were 369 dicotyledonous species from 84 families and 49 Monocotyledonous species from 15 families recorded from Chesterfield County by the Department of Biology at VSU (Table 1).

These collections are needed to be immediately taken care of by proper storage of the species. In addition, these tri-cities are currently experiencing urbanization which results in loss of habitat and potential loss of biodiversity which includes endangered endemic plants. Keeping the current needs of the VSUH, the present exploration was reinitiated as voluntary effort by the authors to preserve and present the floristic data of the collections which will be a useful resource to promote the interest in plant sciences, disseminate the botanical information to the interested community and to utilize the collections in the introductory plant taxonomy courses at Virginia State University. The current study aims to collect measure and present the natural characters of flora of these areas. The present exploration also aims to know ethno-botany. The current investigation aims to add 500 species during 2009-2010 to the existing herbarium collections at the Department of Biology, Virginia State University (VSU) and targeting to expand the VSUH [5].

Major Groups	Species		Genera	Families
	Native	Naturalized		
Pteridophytes	10	0	9	6
Conifers	5	0	2	2
Dicotyledons	369	12	236	34
Monocotyledons	49	0	37	15
Total	433	12	284	107

Table 1: Major Components of the flora of Southeast section of Matoaca District, Chesterfield County Virginia (Shaukat, 1970).

Materials and Methods

A pencil and field notebook to note down the information of the specimen and its geographical location details, knife, blade, and scissors to collect the specimen, a magnifying glass (lens) to observe the miner visible details of the specimen, herbarium sheets (white paper) to press the dried specimens, adhesive tape to glue the dried herbarium specimens on to the white sheet of paper, a ruler and a wooden plank or writing pad to measure the specimens organs, draw margins on the herbarium sheet and to write the details on the sheet in specific location for labelling the finely pressed/mounted specimens following the labelling rules to specify the collection number, date of collection, scientific name with genus and species, family, habitat, nature, flower color and taxonomy, name of the specimen collector and identifier and other details including geographic location. The retired botany professor, Dr. Raghava Rao garu who visited our family in USA and myself, Satya S Narina used our own transportation and enourmous amount of time to collect the specimens. The microscopic examinations of flower were done with the help of electron microscope of the ARS facility and faculty expertise Ms.Edwina Westbrook. The topography of the sample exploring region (Figure 1), a sample picture of the commonly observed species in this region (Figure 2a), image of floral organs taken using electron microscope (Figure 2b) along with the list and number of specimens collected (Table 1) and an example of details collected for each individual specimen (Table 2) were also provided.

Figure 1: Map showing the limits and the topography of the study area.

Table 2: Diagnostic morphological characters of three different species identified from the area.

Character	*Oxalis stricta* L (Oxalidaceae)	*Trifolium repens* L (Fabaceae)	*Lonicera japonica* 'Purpurea' Thumb (Caprifoliaceae)
Leaves	Trifoliate leaf, leaflet cuniate (7x9mm) margin entire	Trifoliate leaf, leaflet obovate (1.2x1mm), margin serrate	Simple, opposite, ovate (2x1cm), margin entire
Inflorescence	-	Solitary, white globose head (1cm diameter)	1-3 axillary clusters in cymes
Flower	Solitary flower, yellow pedicellate	White color, pink with aging	Fragrant 3-4 cm long white color, yellow with aging
Bract	Bractiate	Bracteate	Bracteate
Bractioles	Ebracteolate	Ebracteolate pentamerous	2 bracteoles (1mm), foliate
Calyx	5 polysepalous valvate	5 gamosepalous, valvate	5 gamosephalous
Corolla	5 gamopetalous twisted	Papilionaceous imbricate aestivation, polypetalous, standard petal towards posterior (2x1mm), wing petal (0.5 x 0.3mm), keal petal (0.5x.2.5mm)	5 gamopetalous tube, 1/4 imbricate aestivation
Stamen	10, Monoadelphous in two heights	9+1 Diadelphous	4 unequal
Carpel	Pentacarpellary syncarpous,ovary hypogynous,axile placentation, stigma 5 lobes	Monocarpelary, perigynous, ovary on short stalk, marginal placentation, style lateral	Bicarpellary syncarpous, superior ovary, bilocular, stigma bilobed
Fruit	Capsule (2.5cm)	Legume – pod (0.1cm)	Two separate berries (0.5cm)

(a): *Oxalis stricta* - Habitat (b): *Oxalis stricta* - stamen and carpel

Figure 2: Images of *Oxalis stricta* (a). Whole plant and its habitat (b). Flower's internal organs.

Location and climate of the current area of exploration

The study area is south eastern part of Virginia (Figure 1). This is surrounded by Henrico County on the north, Charles city and Prince George counties on the east and Dinwiddie County on the south and Powhatan and Amelia counties on the west. The land area under current study is 467 sq mi (1,209 km^2), irregular in shape, lies between the approximate co-ordinates 37° 14'44" and 37° 16' 46" north latitude and 77° 24'14" and 77° 20'16" west longitude. The study area is situated on the two geological provinces, the coastal plains and the piedmont covering gentle hills, Appomattox River, small streams, creeks and some drain ways passing through it. The soils are sedimentary Triassic rocks consisting of low land brown loamy to sandy alluviums in the coastal region and soils derived from weathered material of acidic rocks in piedmont region.

Colonial Heights, Petersburg, Hopewell and Chesterfield county climates are warm during summer when temperatures tend to be in the 70's and cold during winter when temperatures tend to be in the 40's. The warmest month of the year is July with an average maximum temperature of 91°F, while the coldest month of the year is January with an average minimum temperature of 29.20°F. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 23°F, and moderate during winter with an average difference of 22°F.

The annual average precipitation at Colonial Heights and Petersburg is 45.26 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is September with an average rainfall of 4.73 Inches. The annual average precipitation at Chesterfield is 44.37 Inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is July with an average rainfall of 4.46 Inches (http://www.idcide.com/weather/va).

Field work

The field work started in April 2009 and will be continued for the public use in the region. The personal tools used for the current study include: a small plastic metric ruler, a small hand lens, a field notebook and a pencil, a couple of large plastic zipper bags for collecting plant specimens, a small pair of pruners for collecting branches of woody plants, and a digital camera for photographing plant and habitat. The authors also used the electron microscope of our department for the detailed study of the miniature plant organs. The habitat, habit, natural color of flowers and fruits, their flowering and fruiting (Phenological data) are noted in the field notebooks. The diagnostic morphological characters of the three most common plant species identified during the current exploration were presented in the Table 2. Any economically important or otherwise useful information from the local people were incorporated. The literature in this collection will contain descriptions, geographical ranges and dichotomous keys for differentiating genera and species of angiospermic plants in the area as well as information regarding plant naming (Nomenclature) as per ICBN, plant collectors, taxonomy and economic botany. In addition the DNA isolations for the collections will be done simultaneously at VSU's Department of Biology to fingerprint the herbarium collections and for future plant molecular systematic studies. The authors are targeting to computerize the inventories at VSUH and continue the collections by acquiring funds from NSF and USDA.

Upon completion of the current project, The Virginia State University Herbarium provides handful information online to the public on geographical location distribution, descriptions and finger printing data for the species of interest in the tri-cities.

List of few plant species identified from tricity region

American burnweed (*Erechtites hieracifolia*), annual Bluegrass (*Poa annua*), annual sowthistle (*Sonchus oleraceus*), annual tramp weed (*Facelis retusa*), asiatic day flower (*Commelina communis*), barnyard grass (*Echinochloa crus-galli*), beefsteak plant (*Perilla frutescens*), big bluestem (*Andropogon gerardii*), big chickweed (*Cerastium fontanum ssp. vulgare*), bigtop lovegrass (*Eragrostis hirsuta*), bitter dock (*Rumex obtusifolius*), bitternut hickory (*Carya*

cordiformis), black medic (*Medicago lupulina*), black nightshade (*Solanum nigrum*), blue sedge (Carex glaucodea), blunt spikerush (*Eleocharis obtusa*), boston swordfern (*Nephrolepis exaltata*), boxelder (*Acer negundo*), brambles (Rubus spp.), brazilian waterweed (*Egeria densa*), broadleaf signalgrass (*Urochloa platyphylla*), broomsedge bluestem (*Andropogon virginicus*), bulbous bluegrass (*Poa bulbosa*), bull thistle (*Cirsium vulgare*), butter weed (*Packera glabella*), buckwheat (*Polygonum spp.*), Canadian clearweed (*Pilea pumila*), Carolina dessert chickory (*Pyrrhopappus carolinianus*), Carolina geranium (*Geranium carolinianum*), centepede grass (*Eremochloa ophiuroides*), chamber bitter (*Phyllanthus niruri*), cheat grass (*Bromus tectorum*), common carpet grass (*Axonopus fissifolius*), common chickweed (*Stellaria media*), common dandelion (*Taraxacum officinale*), common mallow (*Malva neglecta*), common mouse ear chickweed (*Cerastium fontanum*), common plantain (*Plantago major*), creeping bentgrass (*Agrostis stolonifera*), eastern black nightshade (*Solanum ptycanthum*), ground ivy (*Glechoma hederacea*), japanese honey sickle (*Lonicera japonica*), powell's amaranth (*Amaranthus powellii*), prickly lettuce (*Lactuaca sp.*), prostrate pigweed (*Amaranthus albus*), prostrate spurge (*Euphobia or Chamaesyce*), purslane (*Portulaca sp.*), quackgrass (*Elymus repens*), red fescue (*Festuca rubra*), redroot pigweed (*Amaranthus*), reed canarygrass (*Phalaris arundinacea*), saltgrass (*Distichlis spicata*), sheep sorrel (*Oxalis stricta*), sheperds purse (*Capsella bursa pastoris*), smooth crabgrass (*Digitaria ischaemum*), white clover (*Trifolium repens*), and yellow oxalis (*Oxalis corniculata*).

A few species were presented above among a huge number of annual, perennial, herbacious flowering, vegetable, fruit and herbal species identified or observed in the tricity region including their parks and recreation areas.

Conclusion

These new or introduced and existing herbarium species of VSU in the department of Biology are helpful to develop a course in plant science, botany and medical botany for premedical students, and to train them in biotechnology through digitalization of the herbarium species. The research conducted revealed so many native annual and perennial plant species with a potential and variable uses in herbal medicine, vegetable, ornamental and perfume industry. Some exotic collections with a potential to grow in this region were also recognised. There is a positive hope and expectation to identify some native virginian lawn grass species with a potential to grow in harsh weather conditions and to grow round the year. Currently there were somany online herbaria available unlike in 2008 from which it will become more easier to explore and identify the potential new species of economic value in educating VSU students in medical botany as well as pharmacy or health industry.

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