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FLORISITC COMPOSITION AND PHENOLOGY OF TEMPERATE GRASSLAND OF UTTARKASHI FOREST DIVISION AS INFLUENCED BY FIRE TREATMENT

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ABSTRACT

This paper reports the impact of fire on density, abundance, biological spectrum and phenology of temperate grassland vegetation of Uttarkashi forest division (Garhwal Himalaya). A total of thirty-seven and thirty-four species were recorded at site 1 (Control) and site 2 (fired) respectively. Site 1 was found dominated with *Anthesteria anathera* (Density 35.3 tussock/m^2) followed by *Arundinella nepalensis* (Density 20.86 tussock/m^2). However, site 2 was represented by *Cymbopogon distans* (Density 36.0 tussock/m^2)and *Heteropogon contortus* (Density 20.6 tussock/m^2). Maximum abundance at site 1 was reported for *Anthesteria anathera* in rainy season (35.13) followed by winter season (29.67) and minimum in summer season (15.76). The percentage was found higher at both the sites followed by geophytes. The flora may be defined as thero-geophytic in accordance to Raunkiaer's (1934) terminology. Phenological observations indicate that germination of seeds and sprouting of rootstocks were started with the commencement of rainy season. Maximum flowering was noted during the rainy season.

Key Words : *Fire, Density, Abundance, Biological spectrum, Phenology, Flowering, Fruiting, Vegetative phase,*

INTRODUCTION

The grasslands in India are developed secondarily as secondary successional community in the denuded forestland (Bor, 1942; Agrawal, 1990). They are maintained mainly because of various biotic pressure caused by human beings and animals. Burning of grasslands is a wide spread practice in temperate zone, there exists a great diversity of opinion to whether it is really desirable, if not essential (Agrawal, 1987). By and large, the practice of grassland burning has now come to be regarded as a necessary evil (Salvatori, *et al.*, 2001).

Life form in a community is generally defined as the sum of adaptation of plants to climate. Raunkiaer's (1934) plant life form method of vegetation analysis is most accepted one in delineating main phytoclimatic types (Agrawal, 1987). Pandeya (1974) suggested the utility of biological spectrum in determining the intensity of grazing. The ecological effects of fire are also of great concern in determining the biological spectrum of the grassland communities. The biological spectrum of different regions of India has been discussed by various workers (Agrawal, 1990;

Singh and Arora, 1994; Sikarwar, 1996). Phenology is the art of observing the life cycle phases or activities of plants in their temporal occurrence throughout the year (Lieth, 1974; Singh, 2003). The importance of phenological events is much more meaningful in describing and explaining the seasonal aspects of ecological phenomenon (Agrawal, 1990; Negi *et al.*, 1992). The present paper explains the impact of fire on density and abundance of plant species, biological spectrum and phenological events of species of temperate grassland vegetation at Uttarkashi (Garhwal Himalaya).

MATERIAL AND METHODS

Location of the study area and physiography

The present investigation was conducted in the temperate grassland of Uttarkashi of Garhwal Himalaya. The study area is located at 30° 22' to 31° 25' N latitude and 77° 51' to 79° 27'E longitude and spread over 154 km from east to west and 109 km from north to south. The altitude of the study area was found to vary from 1200 to 1500 m msl. Two plots (Sites) of grassland communities, having similar micro-climatic conditions, one of them had been fired annually by the villagers since last 10-12 years. The vegetation of site 1 (control plot) was found dominated by *Anthesteria anathera* and *Arundinella nepalensis*. However, the vegetation at site 2 (fired plot) was found dominating with *Cymbopogon distans* and *Heteropogon contortus*.

Climatic Conditions

The climatic condition of the study sites is temperate monsoonal (Table 1). Three well defined seasons viz., rainy, winter and summer are distinctly marked. During the study period, the rainfall was found to vary from 12.3 mm (November) to 412 mm (July). The mean maximum and minimum temperatures of the study area ranged from 12.3 (January) to 30.1°C (June) and 2.8 (January) to 18.3 °C (July) respectively (Table 1). The relative humidity was recorded lowest during June (58.0%) and maximum during September (85.2%).

Soil Conditions

Soil samples of both the study sites were collected from three depths (0 – 5, 15 – 20 and 25 – 30 cm), mixed, air dried, rolled and then passed through a 2 mm sieve. The soil texture, pH, nitrogen and phosphorus were determined by the methods described by Wilde *et.al.* (1972). Calcium, potassium and sodium content of the soil were determined by flame photometer method (Sadasivam and Mainkam, 1992). The soil of the study plots was sandy with sand content

Since, the present grassland showed the dominance of therophytes followed by geophytes, the flora may be called as thero-geophytic in nature. Barucha and Dave (1944), while studying a grassland association in Bombay, concluded that higher values of therophytes is an indication of the amount of influence of biotic factors. Saxena *et al.*(1982), also observed the similar results while working with the biological spectrum of Kumaon Himalaya. They concluded that along the major altitudinal gradients (from tropical to alpine), the phenerophytes decreased in importance while Meher-Homji (1964) concluded that the life forms of different regions of the country reflected the bio-climate type of the area.

The phenological events are triggered by rains. Phenodynamic analysis reveals that various phenophases from sprouting of seeds to senescence have pheonological calender that begins with the advent of first shower of rains. The episodic growth of vegetation in rainy season illustrates it to be the peak growth period for the majority of plants. Most of the workers (Singh, 1985; Darmora, 1986; Agrawal, 1990; Negi *et al.*, 1992 and Agrawal *et al.*, 2002) concluded that the progression of temperature and moisture conditions influence the vegetative growth. Majority of annuals flower, fruit and produced their seeds in rainy season while fruiting and seed maturation in a number of perennials are activated during winter. Maximum number of species dried up during the mid part of winter season. Fatubarin (1985), Darmora (1986), Agrawal (1990), Negi *et al.* (1992), Bhandari *et al.* (1999) and Agrawal *et al.* (2002) also concluded the similar findings.

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