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Research article

A X-RAY IMAGE ANALYSIS FOR ASSESSMENT OF FORAGE SEED QUALITY

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ABSTRACT: Seed quality, an important factor in stand establishment is found to vary greatly among seed lots, especially during seed harvesting and processing. X- ray technique was used to discriminate between filled, partially filled and empty chaffy grass caryopsis, establishing relationship between internal structures and seed viability. The relationship between x ray image pattern and germination has been analysed. The potential use of x ray image analysis as a rapid and non destructive means to successfully screen minute forage seeds could be established.

Key words: forage grasses, germination, mammography, seed quality, X-ray radiography

INTRODUCTION

A weed free seed lot is the most efficient strategy to achieve established market standard. Separation of good quality seeds, if done with right equipment and appropriate methods, can increase purity and germination. It can also help in discarding the number of diseased seeds and can improve the visual, commercial and planting quality of seed lot. Seed quality is essential for maintaining the seed viability for extended periods of time. Knowledge of the seed's physical characteristics may offer an insight on germination levels. An x-ray technique allows for a non-destructive evaluation of seed fill, mechanical damage and potential insect injuries. Radiography has been found to be very useful in assessment of seed such as maize [1], cotton [2], forest tree species [3, 4] and industrial crop germplasm accessions [5].

X-ray inspection has a distinct advantage over most of the other detection technologies as it allows non-destructive imaging of interior features of a sample to detect hidden defects or contaminants. However, it also has a number of disadvantages, including a relatively high cost, the need for radiation shielding and the dangers inherent in using radiation, and the need for high voltage power supplies to generate the x-rays. For these reasons, x-ray inspection is generally considered as the last alternative option. Even though x rays are considered to be potentially harmful to seeds, the low rate that is absorbed during the test is not sufficient to induce genetic mutations and does not affect their germination [6, 7] and so, its use continues to expand in the 3 different industries. Till the date, x-rays have found extensive use in manufacturing industries for quality control inspection. But there is no record of x-ray radiography being used in assessing quality of forage grass seeds especially minute seeds. The traditional way to determine viability of seed lot is by performing a germination test. Though effective, germination tests are tedious and time consuming, taking anywhere from a couple of weeks to a couple of years, depending on the seed dormancies involved.

In the present study, a new attempt is made for the screening of seeds, especially minute seeds of forage grasses through x-ray radiography. Efforts have been made to use soft x ray technique generally used for mammography in the field of medicine, to assess the quality of the forage grass seeds.

MATERIALS AND METHODS

Seed samples

Forty five different species of grass florets were collected from Bandheli grassland (Godhra Forest Division) and Rampur grassland (Baria Forest Division), in Gujarat, India. The samples were manually cleaned to remove all foreign matter, dust and visibly broken and immature florets and was subjected to x ray analysis and germination studies. The x-ray studies were carried out at the Department of Radiology and Imaging, The Gujarat Cancer Research Institute, Ahmedabad, Gujarat, India.

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Germination Responses of Several *Poaceae* Members towards Differential Storage Durations

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Abstract

Concerns over biodiversity loss and increasing biological invasion have forced interest on assessment of the effects on native plant species diversity in grassland community. To observe different patterns of grass emergence (dormancy/germination) in the warm tropical grasslands of India, time span of a seed from the seedling stage to a mature plant becomes very crucial for the community development. In the present study seed germination response of six dominant species of the selected study area were tested to record the various effects of dry storage conditions on seed germinability. The species selected were *Apluda mutica* L., *Cenchrus ciliaris* L., *Chrysopogon fulvus* (Spreng.) Chiov., *Dichanthium annulatum* (Forsk.) Stapf., *Heteropogon contortus* (L.) P. Beauv. ex Roem. and Schult. and *Themeda triandra* (R. Br.) Stapf. For this purpose, seed collection at mature seed stage, seed processing and dry seed storage were followed by the germination test system. Obtained results are exhibited in the form of different responses such as, species response patterns towards capacity for immediate germination, responses to dormancy, dry storage and temperature fluctuation. The extent of the requirement in breakage of primary dormancy was highly correlated with the timing of seed maturity, precursors of seed dormancy and seed viability. In present screening out of the six studied species *Apluda mutica*, *Cenchrus ciliaris* and *Dichanthium annulatum* showed dependable germination pattern to fluctuating temperature. The correlation between viability and germination suggests that the germination of *Apluda mutica*, *Cenchrus ciliaris* and *Themeda triandra* are linearly dependent on the viability that the seeds of these species have. As these species showed less influence with the relative fluctuating environment, they can be stored for longer period and frequently can be use for community regeneration in pasture development.

Keywords: dormancy, germination, grasses, grassland community, temperature fluctuation

Introduction

The seedling stage of a plant's life is the most vulnerable by environmental risks and is usually accompanied by extremely high mortality. Thus, the plant demography becomes a fundamental to an understanding of both the ecological forces which shape plant population structure and the evolutionary forces which shape life history characteristic. The seedling and juvenile phases are of particular importance because the heavy mortality which is often observed in these phases may represent a major component of the selection operating in the plant life cycle (Silvertown and Dickie, 1981). Although it is always very difficult to determine the direct causes of seedling death in individual cases, biotic factors, such as predation and disease, and abiotic factors (desiccation) often play important roles in this high level of mortality. Since all these factors show seasonal variation in most habitats of tropical regions, the choice of the season for seedling emergence would be essential for increasing the probability of their successful establishment. To decide season of emergence, seeds may utilize certain types of environmental control of dormancy and/or germination. The relative importance of each of three principal environmental factors controlling seed germination, i.e. light, moisture and temperature, in season choice mechanisms would vary with the types of ecosystems and habitats. Among which high moisture requirement of the seed for germination could be the major factor limiting germination especially during the dry season (Tomado *et al.*, 2002). In habitats seasonal availability of water limits biological activities, rainfall heavier or lesser than a certain threshold level has been demonstrated to serve as a signal for seed germination. In many tropical regions with predictable annual variation in thermal environment, changes in temperature would provide the most reliable seasonal signals for seeds located at or near the soil surface. Various physiological mechanisms have been demonstrated or suggested to be responsible for seedling emergence seasonality: dormancy induction or breakage by certain ranges of temperature; limiting temperatures for the germination of non-dormant seeds; temperature dependency of the rate of germination (Baskin and Baskin, 1985).

In the present study, a germination response of few grass species was conducted. These grass species are dominantly found in the selected study area, situated in Gujarat, India. It stretches from Godhra to Dahod at the eastern edge of the state and situated at 147-164 m elevation (22°50'-22°51' N, 73°42'-73°43' E). *Apluda mutica* L. (Mauritian grass), *Cenchrus ciliaris* L. (Buffel grass), *Chrysopogon fulvus* (Spreng.) Chiov. (Golden beard grass), *Dichanthium an-*

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EFFECT OF STORAGE PERIOD ON THE GERMINABILITY OF KANGAROO GRASS (*Themeda triandra*)

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ABSTRACT

An experiment was initiated to investigate the post harvest changes in the seed quality of Kangaroo grass. Aim of the study was to find out the causes of poor germination of conventionally produced Kangaroo grass seeds by the forest department. Effects of dry storage for various durations were determined on the germinability of *Themeda triandra* Forssk. Seeds were collected from Rampur grassland, Baria Forest Division, Dahod district, Gujarat, India. The collected seed lots were stored in air tight containers at room temperature for the duration of two years. The germination tests were conducted on samples at the regular interval of two months at laboratory conditions by a standard germination method. The storage period affected the germinability of *Themeda* seeds. There was linear response of germination with the increase in the storage duration and reaching at peak between 10 – 16 months of seed storage. After that it declined and reached to zero at the 22 and 24 months of storage. The results suggest that seeds of Kangaroo grass should be stored maximum for 16 – 18 months after harvesting, at the room temperature. The stored seeds can be utilized for re-establishment of grass which will result in 60 – 80% of germination.

Keywords: *Themeda triandra*, germination, storage period.

INTRODUCTION

Kangaroo grass (*Themeda triandra*) is the most common natural pasture grass in India. Rampur grassland, Baria Forest Division, Dahod district, Gujarat, India is the study area for the collection of *Themeda* seeds. Density and dominance wise this species stands second in this grassland. *Themeda* is locally known as "Bhathedu" – a most demandable, acceptable and palatable fodder grass for cattles in the study area. In the study area availability of good quality seeds is the major constraint limiting increased production of Kangaroo grass by the Forest Department. *Themeda* has received maximum attention due to its wide geographical distribution. Several authors have suggested that *Themeda* re-establishment is an important first step for grassland restoration (Phillips 1999; McDonald, 2000).

Themeda grows rapidly from seed and can assume basal diameters of 15 cm in a single growing season (McDougall, 1989). *Themeda* can be effectively restored to small-medium sized areas using seedlings or potted plants (Cole *et al.*, 2000) or by transplanting intact sods from existing remnants (McDougall, 1989). However, large scale seeding technologies are needed if the aim is to restore *Themeda* to areas greater than several hectares (Sindel *et al.*, 1993). Seed structures influence seed dispersal and the selection of micro sites suitable for germination and establishment and thereby affect establishment and survival rates (Peart, 1979, 1984).

However, Ritchie and NeSmith (1991) were of the opinion that the temperature during germination affect the rate and time required for germination, while, Flores and Briones (2001) in a study of six desert species at three temperatures (12, 20 and 26°C) found that as temperature increased, the onset of germination was earlier and the time required for 50% germination decreased.

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DIVERSITY OF GRASSES AND ASSOCIATED LEGUMES IN THE GRASSLANDS OF RAMPUR RANGE IN PANCHMAHAL, GUJARAT

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ABSTRACT

The present study was conducted with an aim to document the floristic diversity of grasses and associated legumes occurring in the grasslands of Rampur Range in Baria Division of Panchmahal District, Gujarat. A total number of around 67 grasses and 29 legumes was deocumented from this region. Among the grasses *Heteropogon contortus*, *Themeda triandra*, *Sorghum halepense* and *Apluda mutica* were found to be dominant in these areas. *Themeda laxa* is not found in any other regions of Baria Division except Rampur grassland. Similarly, among the legumes *Crotalaria albida*, *Crotalaria burhia*, *Crotalaria hebecarpa* were found only in Rampur grassland. *Rhynchosia minima* predominantly was found to be associated with *Ophioros exaltatus* while species of *Indigofera* were found associated with *Heteropogon contortus*. Among the documented grasses in Rozam *Coix lacryma-jobi* is found to be restricted in this region. *Sehima nervosum* is a highly palatable grass which was introduced by the Forest Department in this region. Under the existing natural conditions *Sehima nervosum* has taken over other grasses in few areas in the form of isolated dense patches.

INTRODUCTION

Biodiversity is responsible for harbouring precious gene library and ecosystem processes that regulate atmospheric gaseous composition, climate, watercycle, soil formation, fertility and many other processes of ecosystem (Thakur & Khare, 2008). The term grassland is used to refer to ecosystem in which the dominant vegetative component is comprised of nearly 20% of the landscape of herbaceous species (Coupland, 1979). The earth is covered by grass dominated vegetation which includes communities with a prominent tree component (Savannas) and those without trees (Steppe).

It is conservatively estimated that nearly 25% of the Asian landscape was under grasslands in the past, much of this is now being converted to agricultural land. In tropical Asia, grasslands are ecologically indispensable for they are the most efficient

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VEGETATIONAL DIVERSITY IN THE LAND OF BHEY (GARBADA)

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ABSTRACT

In the present study diversity of grasses and other associated herbaceous flora was analyzed of Bhey which comes in range of Garbada of Panchmahal District in Gujarat state. This region is hilly area with yellow soil. The study was conducted twice (2008), in monsoon and in post monsoon period. The diversity of different species was more in post monsoon period. In this region tree species were found to be more than the herbaceous flora. *Madhuca indica* was predominantly found in this region. Among the grasses *Ischaemum indicum* was found to be the abundant species and the tribal people grow *Paspalum scorbiculatum*. The flour of these grains is used by the tribal Adivasi, Rathva's of this region. The other species present in the area are also utilized by the tribes living in this region.

Key Words: Bhey, Diversity, Grasses, Herbaceous flora.

INTRODUCTION

Biodiversity is responsible for harbouring precious gene library and ecosystem processes that regulate atmospheric gaseous composition, climate, watercycle, soil formation, fertility and many other processes of ecosystem (Thakur and Khare, 2008). Currently worldwide attention is being paid to biodiversity and its conservation. It is basically due to increasing awareness of its importance and the current alarming extinction rates. Documentation, conservation and finding enhancement strategies of biodiversity is considered to be one of the important challenges in present day conservation biology research and policy making process (Nilesh *et al* 2009).

The flora of many parts of Gujarat state has been documented (Shah, 1978, Chavan and Mehta, 1959, Inamdar, 1971), still there are many areas which are not thoroughly studied. The flora of Bhey, situated in the Garbada range of Panchmahal District in Gujarat state is one of them which is not explored. Bhey is a hilly area with yellow soil. It comes under unprotected forest area so the ground flora is much affected by grazing animals and biotic pressure.

MATERIALS AND METHODS

Field surveys were conducted during February and October 2008-2009. The forest area in Bhey was visited and interaction with the local staff and the local citizens of that particular region were made so as to incorporate the local names and utility of these species. The data was collected using line transect (10 M). Photographs of the plants have been taken at the site itself with the help of digital camera (Sony cyber shot DSC-T10). GPS data has been recorded on the spot. Phenological observations were also recorded at both visits. All the specimens collected were serially numbered .Field notes were taken for the pertinent features. Efforts were made to identify the plants from fresh material. Those that could not be satisfactorily identified in the field were brought to the laboratory and identified by checking it with monographs, herbarium specimens and other available literature.

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PICTORIAL FLORISTIC DIVERSITY OF GRASSES AND ASSOCIATED VEGETATION FROM THREE GRASSLANDS OF RANDHIKPUR FOREST RANGE, DAHOD, GUJARAT

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Socioeconomic Study of Grasses and Legumes in Baria and Godhra Forest Division, Gujarat

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Abstract

Gujarat has rich traditional knowledge associated with biodiversity. The cultural diversity in the Indian society reflects close relationship between the existence of human life and nature including all other living creatures and non-living features. The present paper deals with the traditional knowledge of villagers in 10 villages nearby the grasslands in Panchmahal and Dahod districts of Gujarat, India regarding the multipurpose use of grasses and associated legumes prevailing in these grasslands. A survey with the help of questionnaire was conducted to analyze the socioeconomic status. 69 grass species and 34 legumes could be identified growing in these grasslands of which 92 were used for livestocks. Among these grasses the most preferred grass species were *Dichanthium annulatum* and *Sehima nervosum* because of its high palatability. Three grasses and 8 legume species were used for food and medicine. The study emphasize the use of plant wealth to human needs of the regions and assist in appraisal of various anthropogenic interventions accountable for loss of prevailing biodiversity of the region.

Keywords: Baria, grasses, Godhra, legumes, socioeconomic

Introduction

Socio-economics is the study of the relationship between economic activity and social life. The field is often considered multidisciplinary, using theories and methods from sociology, economics, history, psychology, and many others. It has emerged as a separate field of study in the late twentieth century. In many cases, however, socio-economists focus on the social impact of some sort of economic change.

Forest is both ecological as well as economic resource. Forests are home to 50-90% of earths species and are potentially renewable resources if used as per optimum needs and ensuring their security as per sustainability. The functions of a forest may be broadly classified into three categories protective, productive and regulatory functions (Mishra *et al.*, 2008). The socio-economic conditions, the poverty, the illiteracy, unemployment and under employment prevalent in the villages adjoining to the forest forced the people to use the resource as economic resource and never gave an opportunity to think of ecological relevance of the resource in the area. Efforts by the forest department to protect the resource in isolation resulted into conflicts with the locals and more damage to the forest resource leading to the degradation of the land resources.

The contribution of uncultivated wild plants for livelihood support will depend largely on individual circumstances (FAO, 1999). The grassland biome which includes a wide range of ecosystem types from humid priaries to arid shrub grass steppes, has been subjected to particularly intense pressure for the production of food and fibres (Gandhi *et al.*, 2010). These plants can provide an opportunity for cash generation. Value addition may be possible to the collected uncultivated foods if they are processed into edible foods prior to the scale.

Many wild plants have significant economic value. By preventing the need for cash expenditure, and income derived from the collection and sale of these resources is particularly important for the rural poor as a source of cash. Some wild plants are important elements for regional identity.

Gujarat state harbors nearly 4,320 plant species which accounts for almost 9.33% of the total floral wealth of India (Agrawal, 2001). The tribals in the state use about 750 medicinally important and 450 economically important plant species. The eastern part of Gujarat has been exclusively studied with respect to ethanobotanical and medicinal values of various plant species (Gopal, 1983; Parabia *et al.*, 1978; Reddy, 1986). More than 61 million people of different ethnic groups following varied religious beliefs live in the Gujarat state, which accounts for 14% of state population. Tribal populations of Bhil, Dhodiya, Kolcha, Koli, Konkni, Gond, Gamit, Valvi, Talvi, Padhar, Pateliya, Rathava, Siddi, Waghri, etc. spread over 8 districts, predominantly inhabit the forest areas all along its South-eastern boundary. These tribal people mainly depend on forest for their shelter, housing material, food, fuel, fiber and feed. Traditional knowledge accumulated generations to help peoples protect their nutrition and health and manage their habitats (Olsson *et al.*, 2004). The possibility that traditional knowledge may be rapidly and widely lost in response to globalization has become a major concern

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