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SEED GERMINATION OF *ANACYCLUS PYRETHRUM*D.C. IN EXPERIMENTAL FIELD

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ABSTRACT

The human society has been depending upon the forest resources for its sustenance, nourishment and keeping itself healthy, developing resistance to various ailments and the therapeutic uses. It is well said that good digestion regime is a boon to human race. The health and good digestion primarily depend upon the active and appropriate role of teeth. Tooth decay or carious teeth is one problem from which humans generally& mostlysuffer. Having developed most modern tooth pastes & tooth powders, including the use of the canalized tooth brushes, the teeth suffer from the problem of decaying, resulting in poor performance of food chewing, to disturb the digestion regime of human beings. There have been many claims to prevent tooth decay but for the want of the use of appropriate medicinal components in the tooth pastes & powders, this remains an acute problem. *Anacyclus pyrethrum* DC is one plant of Astraceae family, which possesses the property of arresting the tooth decay, carries, tooth ache & tonsillitis.

Anacyclus pyrethrum DC is an exotic to India and has been introduced on a small scale in some southern parts of the country. In the present research investigations, experiments have been carried out to propagate this important exotic species in the sub- tropical, tropical and sub- temperate regions of the Garhwal Himalayas in Uttarakhand state. Seed germination is a prelude to the cultivation of the plant species and it affects the cost of production of plants in the case of rare & costly seeds.

Seed germination experiments were carried out and it was observed that the germination in seed germinator is 79.5% and the maximum field germination of 57.5% was observed in sub- tropical field area. Studies on total germination, peak germination and mean germination value were also done.

Key words: Seed germination, Mean seed germination,Anacyclus pyrethrum, Carious teeth, tonsillitisexotic.

INTRODUCTION

Medicines from herbs has been one of the oldest practices for maintaining health and vigour. The development of this sector started from the human observations of the animals and the reactions of particular herbs on human body &its system. The ethno -medicines paved way for the home remedies and folk medicines. As times changed, and man started weighing everything on the scales of reasoning, the scientific & clinical verifications are done to verify and ascertain the validity of old claims in home remedies, folk medicines and the ethno medicines. The verification of the properties of herbals came as a developmental step. With the migration of the communities, during the development of the human race, tonew areas, additions to the knowledge were made. The use of the herbal medicines became a profession, as only a few dedicated people's practicized it. Introduction of new plants & cultivation for therapeutic use became common practice. The adage" good digestive system is dependent upon the healthy teeth" gave rise to the development of the **' canalized tooth brush'**; some other material sadded to the herbal products were used to develop tooth powder and further development as tooth pastes. The human instinct to find comparatively effective ingredients for keeping teeth healthy & clean directed it to use some proven exotic plants.

Exotics have played important role in the field of herbal medicines. Various exotics used in herbal industry in India include: *Eucalyptus spp., Digitalis lanata, Digitalis purpurea, Cathranthus roseus, Atropa belladonna, Acacia Senegal, Saussurea costus, Cephalis ipecacunha,Cincona calisaya* andmanyothers.

Anacyclus pyrethrum DC is native of Arabia and distributed in North-Africa and grown as ornamental herb in Europe and other temperate countries. In India, it is cultivated as medicinal crop on limited scale in Bangalore and Nilgiri Hills in Tamil Nadu (Sarin, 2008).

Anacyclus pyrethrum DC isperennial procumbent herb belonging to family Asteraceae. Leaves are bipinnately segmented and green in colour . Flowers are yellow in heads (capitulum), each twig bears one large flower, the disc being yellow and the ray florets being white, tinged with purple beneath (Anon, 2005).

A decoction of the root is useful as a gargle in carious teeth, toothache, sore –throat and tonsilitis.It has been given in paralysis, hemiplegia, epilepsy, chorea and rheumatism and a host of other diseases. As the root is a sialogogue, it is administered to backward children in the Deccan to make them talk. Its roots boiled in water are given as drink in diabetes (Nadkarni, 1976). An Indigenous drug FORTEGE, containing *Anacyclus pyrethrum*, *Argyrea speciosa* sweet, and *Withania somnifera* Dunal, is found useful in curing sexual disorders in male (Joshi, 2000).

The demand of *Anacyclus pyrethrum* DC root due to its medicinal value is far greater than the available supply from Indian farmlands. Presently, this species is being substituted by *Spilanthes acmella* (Desi Akarakara)and other species, reducing the efficacy of the pharmaceutical products.

STUDY AREA

The study area of the present research work is situated between 29^0 26' N to 31^0 28' N Latitude

and 77^0 49' E to 80^0 6' E Longitudes in the Garhwal Himalaya. This area comes under the Narendra Nagar Forest Division (Bhagirathi Forest Circle) of Department of Forest, Uttarakhand State. The altitudinal variation of the Narendra Nagar Forest Division contains areas of sub temperate climate varying from 1500 to 3000 m. amsl and the sub tropical areas between 800 to 1500 m. amsl with the tropical regions having altitudes below 800 meters. The present studies, on the *Anacyclus pyrethrum* DC species, were undertaken at three sites selected from the three climatic zones in the Narendra Nagar Forest Division. The tropical zone being represented by the Site: 1 at Dr. Susheela Tiwari Herbal Garden Muni-Ki-Reti, Tehri Garhwal (421m. amsl) [**HG**]; the sub- tropical zone site:2 at Dhaula Pani in Narendra Nagar (960 m.amsl)[**NN**];and the sub- temperate site:3 at Kaddhukhal (2500 m.amsl)[**KK**]..

MATERIALS AND METHODS SEED COLLECTION

Seeds were collected from the mature and healthy plants from Kauntalani Nursery, Chakrata Forest Division. The seed collection was done in the month of June in 2007. The seeds were dried in shade and stored in airtight containers until used for the experimental purposes

Seed Count

One gram of seeds was accurately weighed appropriate replicates using digital balance (Sartorius) and these were spread on a filter paper evenly and manually counted under a magnifying glass.

Germination is regarded as phenomenon which commence with uptake of water by quiescent dry seed and terminate with the elongation of the embryonic axis (Bewleys ,1997). In the life cycle of plant, seeds have the highest resistance to extreme environmental stresses, whereas seedling are most susceptible (Gutterman,1993).Therefore, successful establishment of a plant population is dependent on the adaptive aspects of seed germination and of early seedling growth (Huang *et al,.*2008).Ecological studies of economical important species provide prerequisite information to bring them under OBSERVATION cultivation. With this aim in mind studies were undertaken for seed germination in three different altitudes described under the heading study area.

Mean seed germination

Mean daily seed germination calculated by daily numbers of seeds germinated and progress until no more germination was observed. It was calculated by using formula cited by Ellis *et al.,* (1980).

Germination test

Germination test for determining the percentage of seeds that produce healthy root and shoot was calculated formula as used by Nawchoo *et al.(*2004).

$$G\% = \frac{\text{Number ofseed Germinated}}{\text{Total Seeds}} \times 100$$

G% = Germination percentage.

Seed germination under laboratory conditions

The seed germination was conducted under laboratory conditions (seed germinator) at Pt L.M.S.P.G. College Rishikesh. The seeds were pretreated with a 0.1% solution of Mercuric chloride($HgCl_2$) for 2-3 minutes to safeguard against any probable fungal association. The seeds were thoroughly washed in distilled water before experimentation. Seeds were sown in Petri plates (9 cm diameter) between two layers of Whatman No.1 filter paper with four replicates containing 100 seeds each. Petri plates containing seeds were placed in seed germinator at 15^0C and observed daily for germination, initiation and progress until no more germination was found. Radical emergence (>2mm) was recorded as seed germination. The germination progress was recorded every day till no further germination wasfound.

Seed Germination in experimental sites

The specially prepared seed germination beds were prepared for conducting the seed germination experiment in the field beds. The FYM, sand and soil ratio was kept 1:2:2. The FYM was used for its easy and universal availability and for inherent demand of nutrition for the germination. The average height of this raised soil bed was kept at 23cm.

The seeds were sown in rows 5 cm apart

and at a distance of 1 cm. the seed germination beds sites require was 25 x 25 cm for the each replicates. Four replicates were tried in each site. Each experimental site was observed for germination, initiation and progress until no more germination was observed. Radical emergence (>2mm) was recorded as seed germination.

RESULT

Seed Count: An average seed weight of 0.010g /100 seeds was observed amounting to approximately 6, 00,000 seeds per kg. This approximation is due to the mixing of the seed cover and other materials that are difficult to remove.

Seed Germination: The germination trials were conducted under Laboratory (Seed Germinator) and field condition with appropriate numbers of replicates. The seeds sown in the germinator and in the experimental field were regularly observed from the dates of sowing till the dates no further germination were observed. The germination records are presented in the Table1

Site	No. of seeds sown	No. Seedsge rminated	Total Germi-nation %
Seed germinator	**400**	**318**	**79.5**
HG- germination beds	**400**	**164**	**41.00**
NN- germination beds	**400**	**230**	**57.50**
KK- germination beds	**400**	**179**	**44.75**

Table 1:Germination of seeds in the seed germinator and experimental sites

The total germination percentage of 79.5 were observed in the seed germinator. The seed germination under laboratory conditions initiated after 5 days of sowing and was completed by 16 days after sowing. The Mean Daily germination of *Anacyclus pyrethrum* seeds in the Seed Germinator revealed that the maximum number of seeds 15% germinated on the 11th Day (Figure1.1).

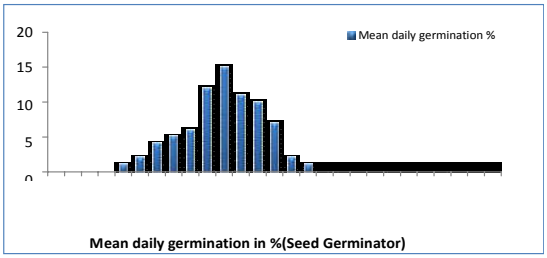

Fig1.1: Mean Daily Germination in the Seed Germinator

The maximum germination (15.0%) was observed on the 11th and followed by 12 % on the 10th day after sowing. The most of the seeds (55.25 %) geminated between 10th to 14th days after sowing. Fig1.2 exhibits : mean Daily Germination % in the Seed Germinator.

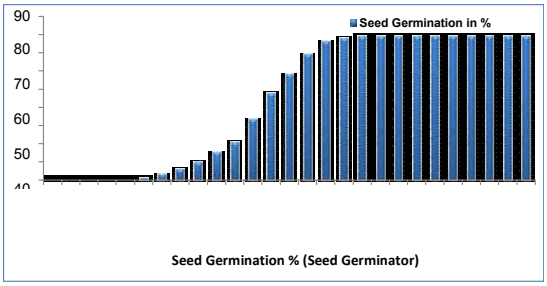

Fig 1.2: Mean Daily Seed Germination % in the Seed Germinator Seed germination in field

Out of the three experimental sites, highest seed germination percentage 57.50 recorded in site-2(NN) followed by 44.75% in site-3(KK) while minimum germination percent 41 recorded in site-1(HG).

In site -1(HG), seed germination started after in 14 days of seed sowing and completed on the 28th day. Fig 1.3 shows the mean Daily Seed the Site-1 [HG]

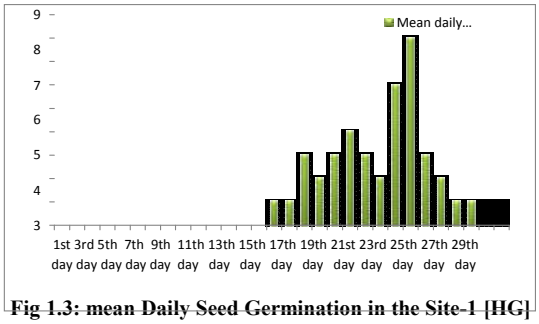

Fig 1.3: mean Daily Seed Germination in the Site-1 [HG]

The Mean Daily germination of *Anacyclus pyrethrum* seeds in the site-1(HG) revealed that the maximum number of seeds 8 % germinated on the 24th Day . Fig 1.4 exhibits the mean Daily Seed Germination % in the Site-1 [HG].

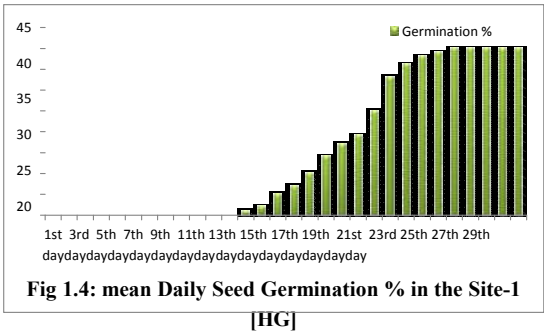

Fig 1.4: mean Daily Seed Germination % in the Site-1 [HG]

Mean Daily germination of *Anacyclus pyrethrum* seeds in site-2(NN) revealed that the maximum number of 12% seeds germinated on the 27th Day. Fig 1.5 exhibits mean Daily Seed Germination in the Site-2 [NN]

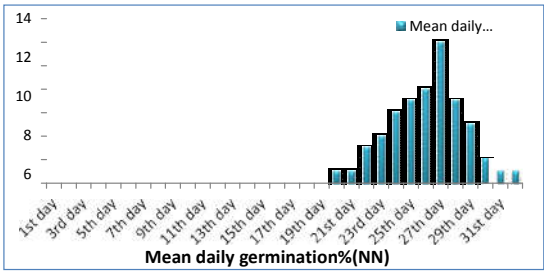

Fig 1.5 exhibits mean Daily Seed Germination in the Site-2 [NN]

In experimental site-2(NN), seed germination started in 20 days after sowing and completed in 32th days. The seed germination percentage recorded maximum (57.50%) in this site. **Fig 1.6 shows mean Daily Seed Germination% in the Site-2[NN]**

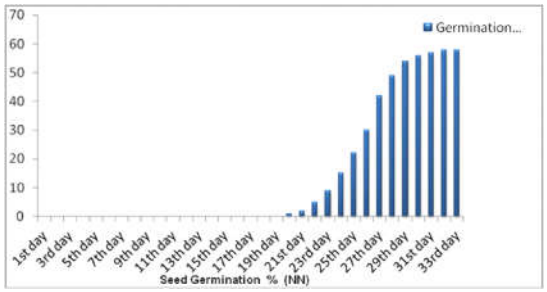

Fig1.6: exhibits mean Daily Seed Germination % in the Site-2 [NN]

Mean daily germination percentage was recorded 10% maximum germination was recorded on the 34th day,which has been exhibited in figure. **Fig1.7 exhibits mean Daily Seed Germination in the Site-3 [KK]**

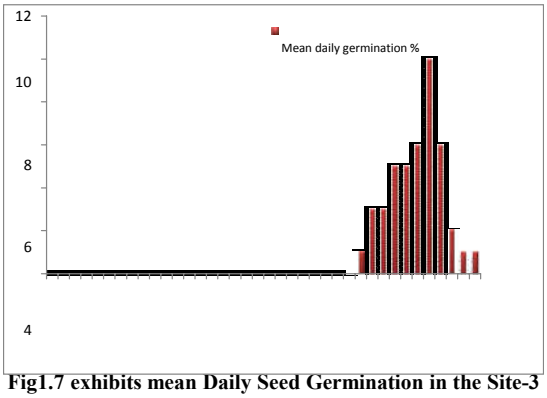

Fig1.7 exhibits mean Daily Seed Germination in the Site-3 [KK]

Seed germination percentage in site-3(KK) was recorded 44.47. The seed germination took 39 days for complete germination in germination beds. The germination started 29 days after sowing and completed in 39 days. **Fig1.8 exhibits mean Daily Seed Germination % in the Site-3[KK]**

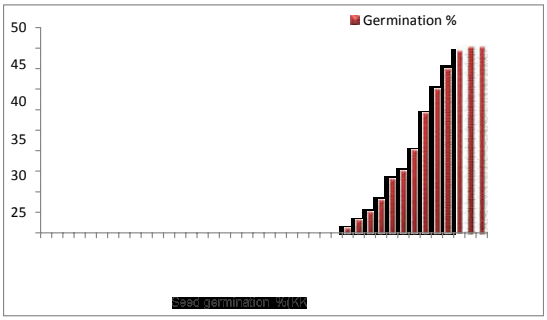

Fig1.8 exhibits mean Daily Seed Germination % in the Site-3 [KK]

DISCUSSION.

The number of seeds in one kilogram quantity were found to be 6 (Six) Lac. The highest seed germination percent 79.5 was observed in the laboratory conditions i.e. Seed Germinator; as the optimal conditions of temperature (15^{O}C) and moisture were maintained. Similarly high seed germination in laboratory condition reported by

Purohit (2006) in *Picrorhiza kurrooa* (Royle ex Benth).Specific reports regarding the germination percent are not reflected from the presently available literature at othersources.

In field condition different sites reflects different germination percentage, the highest germination percentage was found in Site-2(NN), followed by Site-3(KK),which was 57.50 and 44.75 respectively, while lowest germination percentage (41%) reported in site-1(HG). The difference in the seed germination reported by Verma (2008), may be due to several factors including immaturity of seed, temperature, available moisture and light conditions in which seeds are exposed. This view is also supported by Sen *et al.* (1995), Kasera *et al.,(* 2003) and Hong *et al.,* (2009). In the process of germination, the soil embedded seed require an optimum temperature(Schutz *et al* .,2002), supply of water and oxygen as well as the presence of favourble endogenous factors within the seed itself (Mengel *et al.,* 1987).

The *Anacyclus pyrethrum* DC fruit / seed is an one seeded cypsela i.e. one seeded achene with a persistent scale. In majority of seeds, at the time of germination, water enters through the micropyle. The appendage to the seed may inhibit the entry of the water and consequently affect the germination of seeds. This view also supported by Sheldon(1974) that seed morphology may play role in seed germination.

Mean germination time (MGT) in laboratory and field shows lots of difference in days due to physiological conditions provided to seed for germination. The life cycle of a plant starts with the germination of seeds in most of the cases. The germination of any seed indicates the activation of dormant testa, radical and plumule into root and shoot system and conversion into a seedling. The ripe and viable seeds are capable of germinating on getting conducive conditions. Germination percent isthe percentage of seeds that germinate and grow into seedlings. The present study has realized that due to the minute size of the seeds, its mixture with ash and putting a light hay or barn cover helps to maintain the temperature and controlling the evaporation of moisture. Though not much literature is available on the germination of the *Anacyclus pyrethrum* but the general practices utilized for the germination of minute seeds were followed. The seeds were not given any pre treatment beforesowing.

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