

Phonology and Reproductive Biology of Commonly Known Tuber Vegetable Plant - Potato (*Solanum Tuberosum* L.)



Science

KEYWORDS : Potato cultivation, Deesa, Phenology, Reproductive biology.

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ABSTRACT

*The present paper deals with phonological and reproductive observation of commonly known plant potato (*Solanum tuberosum* L.) in the Deesa and its adjoining area of Banaskantha district. Deesa taluka is popular for potato production in the Gujarat and called "POTATO CITY". Potato plants are annual long day plant, herbaceous perennials that grow about 60 cm (24 in) high, depending on variety, the culms dying back after flowering. They bear white, pink, red, blue, or purple flowers with yellow stamens. The phonological and reproductive characters were observed through micro observation (plant height, no. of leaf, inflorescence per plant, flower per inflorescence, flower anthesis, pollen study, stigma receptivity etc.) and collecting data. Potato plants are grown during winter (November to March) with cool and humid environment.*

Introduction

Potato (*Solanum tuberosum* L.) is a member of Solanaceae family and one of the most nutritious sources of food in the world. Potato is a native of South America and is one of the fourth most important food crops worldwide after Rice, Wheat and Corn. Potato crop has got immergence potentiality for the cultivation in Gujarat, Punjab, Haryana, Uttar Pradesh etc. The profitable crop is mainly grown in winter season. It is unique and model cultivation of potato under riverbed condition. In case of Gujarat, Major potato growing districts are Banaskantha, followed Anand, Kheda, Sabarkantha, Aravalli, Gandhinagar and Mehsana. The phenological events are meaningful in describing and explaining seasonal aspects of ecological phenomenon and helps in felling series, utilization of by products and management of the species (Dabgar and Mali, 2010).

The present papers deals with phenology and reproductive observation and support to plant breeders and other researchers for making natural adaptive new variety through various mechanisms of hybridization. Moreover, all information is using in crop management, cultivation for high yielding and high nutritional value.

Materials and methods

The present work has been carried out in some selected farms of Deesa taluka of Banaskantha district. Present investigation was carried on *Solanum tuberosum* L. First choose the verity of potato (*Solanum tuberosum* L. Cv-Kufari Badshah). Than after Planting in 3X2 meter plot emergence of potato after 20 to 25 day. Potato crops were irrigated by floods and sprinkler method with insecticides and fungicides for securing the crop. Than after studies of plant growth and note the detail phenological events (Planting seed, emerging child plant, development behaviour in plant till maturation, leaf developments and flowering season etc.) were recorded over a periods of two rabi seasons (2013-2014) to obtain the above information observation were made every day in the morning, noon and evening hours during the flowering periods (January to February). Flowering season comes at mature plants of 40 to 55 days, and reproductive characters (bud initiation, duration glooms of flowering, time of flower anthesis, Time of anther dehiscence, pollen studies by microscope with staining method, time and period of stigma receptivity, seed weight were studied by various methods after Shivanna and Rangaswamy (1993). Last, harvesting time of tubers distinguished to tuber quality, shining, size and weight. Potato tubers are graded on the base of weight A, B and C. A more than 200 gm, B is 100 gm to 200 gm and C is less than 100gm.

Result and Discussion

Potato (*Solanum tuberosum* L.) is one of the most important

rabi vegetable cash crop, which has got an unlimited potentiality of its cultivation in Gujarat State. Deesa is one of the most important pockets for potato cultivation and production rate in Gujarat. It falls under the North Gujarat Agroclimatic Zone-IV of the State. High remunerative crop rotation for Deesa region of north Gujarat is advocated involving groundnut in kharif, potato in Rabi and bajra in summer. Castor, Wheat, Amarantha, Mustard, jira crops are also culturing in rabi seasons at Deesa and its adjoining area of Banaskantha district.

CLIMATE OF PLANTING TIME

Particular to Deesa area potato is essentially growth with cool and warm moist regions and grows best in a climate where cool nights alternate with warm days during the period of tuber formation. Potato vegetative seeds are planting during second fortnight of November to December second week in winter season a mean growing temperature between 15°C to 21°C of all area of Banaskantha district

SOWING OF POTATO

The Plants was grown as annuals and propagated vegetatively by using tubers. Large seed potatoes are cut into several sections, each having at least one eye (meristem bud). Potato planted by hand or planter machine, for getting more economic return with high proportion of marketable tubers, it has been recommended the spacing 50 cm x 15 cm in ridge & furrow method for farming community as traditionally farmers were planting flat sowing. This spacing and method is adopted by the Banaskantha farmers and other farmers of Gujarat.

EMERGENCE OF POTATO

Potato emerged after 20 to 22 days. Plant height 5 cm. to 13 cm. of 25 days after planting (DAP) and 3 to 7 compound leaf. DAP of 45 plant height 35 to 45 cm. and 8 to 13 compound leaves. 69 days plant height 60 to 70 cm and 13 to 18 compound leaves, while above go day or harvesting time plant height 60 to 70 cm and compound leaf fall and some 10 to 15 leaf present.

PHENOLOGICAL OBSERVATION

INITIATION OF FLOWERING BUD (INFLORESCENCE).

Flower buds observe in enhancing condition but some percentage. Flower bud present in natural condition. Bud initiation started in January on an average it took 45-50 days after planting.

4.2 DAY TO INITIATION OF FLOWER.

Potato emerge normally flower under cool, long days, condition with more than 10 hours sunlight. Initiation of flower occurred in Kufari Badshah verity. The average day's initiation of flower was maximum 55 days while it was minimum 45 days.

4.3 DURATION OF FLOWERING

A precise knowledge of the duration of flowering is important because, it facilitates artificial pollination in hybridization program. Flowering in potato started in the second week of January along with the new flush of leaves. It continued up to second to third week of February. The flowering duration was maximum 56 hours while it was minimum 43 hours.

4.4 NUMBER OF INFLORESCENCE AND FLOWER PER PLANT

In variety of Kufari Badshah, Each plant has 5 ± 2 inflorescences while each inflorescence having 5-8 reproductive flower at maturation time.

FLOWER BLOOMING

5.1 FLOWER OPENING

The mature flower could easily be distinguished by their white coloured corolla. The shape of corolla was generally round (rotate). The corolla was compact one day prior to the anthesis. The first sign of anthesis was indicated by the appearance of longitudinal cracks at the apex of corolla with the style appearing first before the stamen appeared. The style length may be longer than the anther cone. After 20-30 minutes, cracks in the corolla widened to the middle of the bud and after another 20-30 minutes, crack went on widening gradually. See parting the lobes of corolla and five stamens became visible. Stamens were composed of anther and filament joined in the corolla tube. Anther were generally fused in a conical structure or spared loosely enclosing the pistil. The colour of anther varied from light yellow to deep orange.

5.2 TIME OF FLOWER ANTHESIS.

It is revealed that anthesis started in the morning hours From 5:30 AM. on words when Temperature was low, anthesis continued to 9:00 AM. Maximum anthesis 5:30 to 7:30AM. This Show marked effect of temperature and relative humidity on anthesis.

5.3 TIME OF ANTHER DEHISCENCE

Anther dehiscence started after anthesis of flower, generally half an hours to one hour later. On normal day the peak of pollen dehiscence was between 7:00 to 8:30am and very little preparation of anther dehiscence before and after this period. Data clearly indicated that temperature and relative humidity had a direct effect on dehiscence of anther. Anthers may open before or after the flower according to the sequence of male and female receptivity in a given species (Pacini, 1992).

POLLEN STUDY

6.1 POLLEN MORPHOLOGY AND SIZE

The fertile pollen grains were faint yellowish in colour and mainly round in shape, On the contrary, sterile pollen grains were almost hyaline with irregular round shape. The pollen grain possessed 3 germ pores. The mean size of pollen grains 25.0 to 34.24 μ (0.32 to 0.34 μ) were observed in microscope field

6.2 POLLEN VIBILITY

The pollen may leave the anthers as soon as they open or be held in the anther by devices such as pollenkitt, tryphine or elastoviscin (Fluids of different viscosity and ontogenesis), viscin threads or sporopollenin filaments (exine extensions that tangle with the pollen). Pollenkitt, tryphine, elastoviscin and viscin threads are all tapetal products (Pacini and Franchi, 1993). Pollen viability was determined by acetocarmine stain ability test. The Pollen grains stained deeply red, looking normal under microscope were counted as viable, while those shriveled and unstained were considered as non-viable. The result revealed that pollen viability varied from 64.55 %.

STIGMA RECEPTIVITY

In *Solanum tuberosum* L. stigma was round and pinhead type. The stigma became dark green, wet, shiny, glossy and sticky at the time of anthesis indicating its receptivity. Stigma remained receptive for 1-2 days prior to dehiscence. Stigma is best indicator for pollination (Mali, 2013). Unpollinated stigma is signed with greenish yellow and become dark brown after pollination.

FRUIT DEVELOPMENT

That fruits of potato took about 49-56 days to reach maturity. The developing fruits were regularly observed during their growth. The shape of fruit was usually round but oval conical or pear shaped fruits were also seen. The fruits increased rapidly in diameter after fertilization.

SEED WEIGHT

It is obvious from that seed weight per fruit was recorded maximum 0.38gm and minimum 0.02gm.

TUBER SHAPE AND WEIGHT

Tubers qualitative and quantitative characters are most important role in grading procedure for high profitable returns. Tubers are generally used in vegetables and chips making. Tuber shape was usually oval and weight is maximum 2.1kg average mean 200 to 300 gm per tuber. That coloured bright brown yellowish on black spots, scaly leaf, and eyes present. Similar and same sized tubers were collect for put on the market, small sized with numerous eye spot tubers are exploit to vegetative seed for next year.

Morphology of Tubers

The tuber is the short, greatly enlarged apical portion of the stolon, full of stored food. It is a short ended thick end stem bearing a group of buds or 'eyes' protected by scale-like leaves. Which are soon shed, Leaving a rudimentary leaf scar (eye brow) or ridge. The eyes may be shallow, medium or deep, the 'eyebrow' being well marked (semi circular) towards the heel or attachment and where the tuber is attached to the stolon.

Conclusions

The potato is worldwide common vegetable with contains vitamins and minerals, as well as an assortment of phytochemicals, such as carotenoids and natural phenols. It is important to cultivate and improve qualitative value through natural selection. Numbers of variety of potato are grown in the Gujarat and worldwide. The Kufari Badshah and Kufari Pukhraj varieties are mainly grown in almost 95 % areas under potato of Deesa and its adjoining area. Life span of potato has 90 to 120 days in rabi (winter) season. Cropping sequence of Ground nut - Potato - Bajra adopted by 95 % of farmers where Potato was grown in rabi season. All the agro techniques are adopted by the potato growers. Potatoes yield abundantly with little effort, and adapt readily to diverse climates as long as the climate is cool and moist enough for the plants to gather sufficient water from the soil to form the starchy tubers.

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