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***Full Length Article***

# Effects of edaphic factors on seed physiology of *Syzygium cumini* skeels

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**ABSTRACT**

An experiment was conducted to study the effects of different depth of sowing on seed germination and seedling growth of *Syzygium cumini.* It was recorded that maximum seed germination of *Syzygium cumini* was at the depth of 3cm and 4cm while, it was minimum at the depth of 6cm. Shoot length was observed to be maximum at depth of 3cm and 4cm while, at the depth of 5cm and 6cm minimum shoot length was observed. When seeds were sown at 3cm root length, number of leaves and collar diameter were found to be maximum. In another experiment different type of soil was used to study the germination and seedling growth of *Syzygium cumini.* Maximum seed germination was noted when seeds were sown in Mix soil and Loamy soil while, Red and Sandy soil showed minimum germination. Maximum shoot length, root length, number of leaves and collar diameter was observed when seeds were sown in Mix soil.

**Key words:** *Syzygium cumini,* Seed physiology, sowing depth and soil type.

## INTRODUCTION

A member of the family, Myrtaceae, the jambolan (*Syzygium cumini* Skeels; syns. *S. jambolanum* DC, *Eugenia cumini* Druce, *E. jambolana* Lam., *E. djouat* Perr., *Myrtus cumini* L., *Calyptranthes ambolana* Willd.). Plants of this family are known to be rich in volatile oils which are reported for their uses in medicine and many fruits of the family have a rich history of uses both as edibles and as traditional medicines in divergent ethnobotanical practices throughout the tropical and subtropical world (Mahmoud *et al.* 2001). Some of the edible species of *Syzygium cumini* are planted throughout the tropics worldwide (Reynertson, *et al.* 2005). The seeds have been reported to be rich in flavonoids, a well-known antioxidant, which accounts for the scavenging of free radicals and protective effect on antioxidant enzymes (Ravi *et al.* 2004) and also found to have high total phenolics with significant antioxidant activity (Bajpai *et al.* 2005) and rich in protein and calcium. The bark is acrid, sweet, digestive, astringent to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers. It is also a good blood purifier. The fruit is acrid, sweet, cooling and removes bad smell from mouth, biliousness, stomachic, astringent, diuretic and antidiabetic (Nadkarni, 1976). The fruit has use for various medicinal purposes and currently use for the treatment of chronic diarrhea and other enteric disorders (Veigas, *et al.* 2007). The seed is sweet, astringent to the bowels and good for diabetes. The ash of the leaves is used for strengthening the teeth and gums. Vinegar prepared from the juice of the ripe fruit is used as stomachic, carminative and diuretic (Kiritikar and Basu, 1987) and it is also useful in spleen enlargement and an efficient astringent in chronic diarrhea. Juice of tender leaves of this plant, leaves of mango and *Syzygium cumini* are with goat's milk and honey to treat dysentery with bloody discharge, whereas juice of tender leaves alone or in combination with carminatives such as cardamom or cinnamon is given in goat's milk to treat diarrhoea in children (Nadkarni, 1976).

The seed extract is used to treat cold, cough, fever and skin problems such as rashes and the mouth, throat, intestines and genitourinary tract ulcers (infected by *Candida albicans*) by the villagers of Tamil Nadu (Chandrasekaran and Venkatesalu, 2004). It is known that light, temperature, soil water content and amount of soil compaction are the main factors that may limit the germination of buried seeds (Pereja and Staniforth, 1985). In this situation, germination is limited by soil depth. Gaikwad (2009) reported that 2.5cm soil depth of sowing and red soil and mix soil supported maximum seed germinability for both the species of *Jatropha.* In India different types of soil are found in various parts of the country. Therefore, to know the effect of these soil types, five different types of soil were used separately for sowing the seeds of *Syzygium cumini* to evaluate the influence of planting depth and soil types on the *Syzygium cumini* seed physiology.

## MATERIALS AND METHODS

### Collection of seed material

In the present investigation seeds of the *Syzigium cumini* were widely collected from Vidoli-Mantha Road, District Jalna (M.S.) India. Collected seeds were then packed in sterile polythene bags in first week of June 2012.

### Sowing of *Syzygium cumini* seeds

Experiment was carried out in second week of June 2012 at Department of Botany, Swami Vivekanand Senior College, Mantha Dist-Jalna (M.S.) India. The seeds were sown during the months of June 2012. The plant seeds were sterilized with 10:1 water/bleach (commercial NaOCl) solution for 5 min and subsequently washed with diluted water. The seeds were sown in polybags. The preferred polybags having size of 22.5 x 12.5 cm were used for sowing. In first experiment *Syzygium cumini* seeds were sown at different depth of 1cm, 2cm, 3cm, 4cm, 5cm, 6cm, 8cm and 12cm in already soil filled polybags. In second experiment, polybags were filled with Mixed soil, Black soil, Red soil, Sandy soil and Loamy Soil. To each polybag single seed was sown. The pots were saturated with water by surface irrigation. During plant growth pots were irrigated daily by spraying with water until water drained from the bottom of the pot. Germination was measured daily for 90 days. All plants were harvested to determine shoot height, root length, number of leaves and collar diameter of shoots (Asgharipour, 2011).

## RESULTS AND DISCUSSION

### Effect of depth of sowing on seed physiology of *Syzygium cumini*

Effect of depth of sowing on seed physiology of *Syzygium cumini* was studied and results are given in table 1. It was observed that maximum seed germination of *Syzygium cumini* was at the depth 3cm and 4cm. Moderate percentage of seed germination were observed at the depth of 1cm and 2cm. On the other hand, it was minimum at the depth of 6cm and null at the depth of 8cm and 12cm. Shoot length was found to be maximum when seeds were sown at depth of 3cm and 4cm. Moderate shoot length was observed at depth of 1cm and 2cm while at the depth of 5cm and 6cm minimum shoot length was observed. When seeds were sown at 3cm root length, number of leaves and collar diameter were found to be maximum. It was interesting to note that considerable number of leaves was observed when seed were sown at 6cm depth. On the other hand, at 4cm depth maximum collar diameter was observed.

### Effect of types of soil on *Syzygium cumini* seed physiology

Effect of types of soil on *Syzygium cumini* seed physiology was carried out and results are summarized in table 2. Maximum seed germination was observed when seeds were sown in Mix soil and Loamy soil. Black soil showed moderate germination while, Red and Sandy soil showed minimum germination. Maximum shoot length, root length, number of leaves and collar diameter was observed when seeds were sown in Mix soil. Black soil showed moderate results and Red soil and Sandy soil showed minimum results with above parameters.

Depth of planting had much more influence on the ability of seedlings to emerge from the soil than on their performance after emergence. During favourable condition and at the time of seed germination stored starch is converted into glucose by enzyme amylase. The seeds which were sown at the depth of 8cm and 12cm were not germinated because at such depth unfavourable condition was created for seed germination and $CO_2$ liberation.

From the results of this study it is concluded that, soil depth of 3 and 4cm and Mix soil, Black soil and Loamy soil improved both seed germination and growth of *Syzygium cumini* seedlings. Hence, above soil depth and soil types are recommended for *Syzygium cumini* nursery growers. Several workers have performed such types of experiment on effects of seed sowing depths on seed physiology. Studies show that *Cirsium arvense* is capable to germinate from a depth of 6 cm (Wilson, 1979). Germination of *Ampelamus albidus* was hampered at depths greater than 5 cm (Soters and Murray, 1981). At soil depth of 10 cm *Cucurbita texana* seeds did not germinate (Oliver *et al.,* 1983). *Morrenia odorataeasy* germinate in depths less than 10 cm (Singh and Achhireddy, 1984) and *Trianthema portulacastrumare* able to germinate from a depth of 9 cm (Balyan and Bhan, 1986). Similar results were also reported on *Jacquemontia* (Shaw *et al.,* 1987). Gaikwad *et al.,* (2009) found that *Jatropha* seed germination was maximum at depth of 2.5cm and in Red and Mix soil. Asgharipour (2011a) reported that, the greatest percentage of *Convolvulus arvensis* L. germination was occurred at planting depth of 1.5 cm. The results of the present study showed that germination percentage reduced with increasing depth of planting.


**Fig 1: Effect of depth of sowing on *Syzygium cumini* seedling parameters**


**Fig 2: Effect of types of soil on *Syzygium cumini* seedling parameters**

**Table 1: Effect of depth of sowing on *Syzygium cumini* seedling parameters**

| Depth of sowing (cm) | % Germination | Mean | | | |
|---|---|---|---|---|---|
| | | Shoot length (cm) | Root length (cm) | No. of leaves | Collar diameter (mm) |
| 1 | 70 | 27.1 | 19.67 | 16 | 10.3 |
| 2 | 70 | 28.82 | 25.92 | 15 | 7.2 |
| 3 | 90 | 29.57 | 22.13 | 18 | 11.6 |
| 4 | 90 | 30.08 | 28.28 | 16 | 11.2 |
| 5 | 60 | 24.25 | 17.76 | 16 | 9.5 |
| 6 | 20 | 18.05 | 12.07 | 17 | 5.4 |
| 8 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 |
| S.E. | 13.36 | 4.52 | 3.85 | 2.69 | 1.67 |
| C.D. at 0.05 | 34.34 | 11.61 | 9.90 | 6.92 | 4.30 |

**Table 2: Effect of types of soil on *Syzygium cumini* seedling parameters**

| Soil Type | % Germination | Mean | | | |
|---|---|---|---|---|---|
| | | Shoot length (cm) | Root length (cm) | No. of leaves | Collar diameter (mm) |
| Mix Soil | 90 | 28.80 | 22.90 | 22.66 | 14.16 |
| Black Soil | 70 | 24.01 | 22.05 | 18.71 | 12.31 |
| Red Soil | 50 | 21.08 | 16.10 | 16.00 | 10.24 |
| Sandy Soil | 40 | 17.30 | 16.17 | 16.00 | 11.02 |
| Loamy Soil | 90 | 23.37 | 24.04 | 20.22 | 13.27 |
| S.E. | 10.20 | 1.88 | 1.71 | 1.28 | 0.72 |
| C.D. at 0.05 | 26.21 | 4.84 | 4.40 | 3.28 | 1.84 |

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