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# Effects of Sowing Time and Seeding Depth on Germination and Growth of Papaya Seedlings

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**ABSTRACT**

*Papaya (Carica papaya L.) is a popular fruit of tropics and subtropics of the world. India is in the forefront of papaya producing nations. Papaya nursery is normally raised by seeds. The experiment was executed at the experimental orchard of Department of Horticulture, CCS Haryana Agriculture University, Hisar, to study the response of sowing time (15th Feb. to 15th Sep. at monthly intervals) and seed depth (0.5, 1.0, 1.5 and 2.0 cm) on germination and growth of papaya seedlings. Papaya significantly affected by time of sowing and depth of sowing. Minimum days taken to start germination were observed in month of July at depth 0.5cm whereas maximum in February at depth 2.0cm, maximum percent germination was found at depth 1.5cm in month of July and minimum at 2.0cm depth in the month of February. Days taken to complete germination were found in month of August at depth 1.0cm, maximum were found in February at depth 2.0cm.*

***Key words:*** *Papaya, Bisexual flower, Fruit crop, Seed.*

## INTRODUCTION

The papaya, melon tree or papita (*Carica papaya* L.) is an important fruits of tropical and subtropical regions of the word. Papaya (*Carica papaya* L.) belongs to the family *Caricaceae* and native of tropical America and believed to have originated in South Mexico. Among the tropical fruits of India, papaya occupies 4th position. It produces 35 per cent of total production at global level. Area and production of papaya have increased sharply during the last few decades, In India the area and production is estimated 132 '000 ha, and 5667 '000 MT, respectively. It is cultivated mainly in Uttar Pradesh, Bihar, Assam, Karnataka, Gujarat, Maharashtra, West Bengal, Andhra Pradesh, Madhya Pradesh and Meghalaya[7]. Papaya is a very wholesome, refreshing and delicious fruit. Green fruits are diuretic and mildly laxative and are used as vegetables. The ripe fruits are rich source of carbohydrates, minerals (Ca, P, Fe), vitamins (carotene, thiamine, riboflavin) and ascorbic acid[3]. The nutritive and medicinal property of papaya are well known, and contains 0.34 g protein, 1.3 g of crude fiber, 40 mg calcium, and 20 mg of phosphorus per 100 g of pulp and contains considerable quantity of carotene, thiamine, riboflavin, niacin, ascorbic acid, tryptophan methionine and lysine, which have their own significance for human health[4].

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It became a popular fruit crop due to its fast growth, high yield, more income, long fruiting period and high nutrient value. It is also used as vegetable and papain production at immature stage and can be a highly profitable crop now because it is easy to grow by seed and is rich in nutrient content besides being highly valued for its digestive properties. The papaya plant has male, female and hermaphrodite (bisexual flower) flowers. Male plants do not bear any fruit. Normally, the fruit shape of female plant is shorter, while that of hermaphroditic plant is longer. The importance of papaya to agriculture and the world's economy is demonstrated by its wide distribution and substantial production in the tropical countries. It gives the highest fruit production and income per hectare next to banana. Papaya's cultivation has good economic potential especially due to its multifarious uses which indicates excellent scope of its utilization. It is highly susceptible to water logging; even a 2.5 cm of water standing around the tree for few hours is likely to kill the plants. Clay's soils are not ideal for papaya cultivation as they easily get waterlogged. Extreme hot summers or winters are detrimental for the growth of papaya; a dry warm climate tends to add to the sweetness of the fruit. The type of flowers and fruits formed on a papaya tree are influenced considerably by the temperature prevailing in the locality (Ram Raghu, 2007). Papaya deserves greater attention due to its higher nutritive value and production potential. Presently the production of papaya falls extremely short of actual requirement of the state, hence sizeable quantity of papaya comes from the neighboring states. Considering its increasing demand and profitability, systematic efforts are required be made to increase the area and production of papaya crop in Haryana. However, the required information likes suitable time of nursery raising, seedling transplantation in field, suitable varieties, nutritional requirements; cultural practices etc. are quite inadequate fruits cultivation in sustainable manner. Various planting densities are recommended for papaya to get higher productivity depending upon cultivars and time of planting. The limits of papaya production are rather defined by prevailing soil and climatic conditions in different parts of India and it is evident from the state wise distribution of this crop. The agro- climatic conditions of Haryana are different from the other parts of the country. Which also imposes a technical completion to optimize different cultural practices for its successful cultivation of papaya seems to be a potential fruit crop for Haryana also. Hence, the present studies have been undertaken with the objective to study the production practices for sustainable cultivation of papaya under Hisar conditions.

## MATERIAL AND METHODS

The present investigation entitled studies on the cultivation of papaya (*Carica papaya* L.) under Hisar conditions was carried out in experimental orchard of Department of Horticulture, CCS Haryana Agriculture University, Hisar to determine the influence of sowing time and seed depth on germination and growth parameters of papaya seedlings. Experiment was laid out according to randomized block design having thirty two treatments replicated thrice. About 40 $m^2$ area were used for preparing raised nursery beds of 200 x 60 x 15 cm size and was properly manured with 100 kg FYM prior to sowing the seeds. The seeds of cv. Pusa Nanha were purchased from Division of Fruits & Horticulture Technology, I.A.R.I., New Delhi, is used for carried out the experiment. Hundred seeds per replication were treated with captan and sown at 15 cm distance with 0.5, 1.0, 1.5, and 2.0 cm depths. The planting period varies from 15$^{th}$ February to 15$^{th}$ September at monthly intervals. Water was applied in the nursery beds immediately after sowing of seeds. The beds were mulched with dry grass after seed sowing to conserve the moisture in the nursery beds. Germination and other growth parameters of the papaya seedlings were observed at fortnight intervals up to 2 months.

## RESULTS AND DISCUSSION

### Germination initiation

Data presented in Table 1 reveal that the germination initiation of papaya seeds was significantly affected by seed sowing time and depth. The number of days taken to initiation of germination was minimum at the depth of 0.5cm followed by 1.0cm, 1.5cm and 2.0cm during the all months of sowing. The maximum numbers of days taken to start germination (32 days) were observed in the month of February at depth of 2.0 cm where as minimum numbers of days (11 days) were found in month of July at 0.5cm sowing depth. From the data presented in table under sequence it can be revealed that the minimum days taken to start germination were observed in month of July followed by August and September where as maximum days were taken by the seeds sown in February followed by May and June. It may be due to the effect of temperature of different month and different depths on germination. Low depth 0.5 cm of the seeds sowing takes minimum number of days which may be due to availability of good moisture for early seed germination, whereas 2.0 cm of seed depth takes maximum number of days may be due to deep sowing of seeds in all months of sowing but July had favorable temperature, humidity and available moisture for seed germination similar findings have been reported by Shrivastava *et al*[8].

### Per cent germination

The data in Table 1 indicates the germination percentage of papaya seeds was also affected by depth and time of sowing (Figure-1). The maximum germination percentage (71.58%) was recorded in the month of July followed by September (71.25%) and August (69.50%). Minimum germination percentage (47.0%) was observed during the month of February followed by May (53.83%) and March (56.33%). The per cent germination was also effected by seed sowing depth and maximum germination (64.79%) was found at the depth of 1.5cm whereas minimum germination was recorded at the depth of 2.0 cm during all the months of seed sowing. These observations were in conformity with the results of Barche *et.al.*[2] under North Indian conditions.

### Germination completion

Data on completion of seed germination of papaya seed sown at different depths as presented in Table 1 show that the minimum days (8) were taken to complete germination by the seeds sown at the 1.0, and 1.5 cm depths during the month of August which was followed by seed sown at 0.5 cm. depths during the month of September (9 days) and July (10.33 days). Maximum days for completion of germination were recorded during the month of February (18.66) followed by March (18.0) and June (18.0) sown seeds at 2 cm. depth. On over all bases it is presented from the data that maximum seed germination percentage (71.58), minimum days (15.66) for germination intuition and earliest germination completion (8.0 days) were observed in July sown seeds at 1.5 cm depth. It may be due to favorable climatic conditions in months of July to September in all sowing depths but in month of February and March temperature was very low whereas in month of June temperature was very high as showed in metrological data which might be effect the complete germination under North Indian conditions Barche *et.al*[2]. Minimum number of days required for seed germination, maximum germination percentage and minimum days for completion of seed germination during the month of July may be attributed to the ambient temperature (36.7) and humidity (78%). These findings are also supported by of observation expressed by Jeyakumar *et al*[5]. Where it is clearly established that the abiotic stress factors particularly temperature and water content influenced many eco physiological process of papaya plant.

**Seedling height (15, 30, 45, 60, 75, 90 DAS)**

Data on seedling height recorded at forth night intervals up to 90 days after seed sowing is presented in Table 2 The data reveals that the seedling attained the height 0.4, 0.36 and 0.30 cm during the month of July, August and September respectively at 0.5 cm seed sowing depth. No seedling height could be recorded during the remaining months and seed sowing depths as no seed germination was observed up to 15 days. It also evident from the data that during the 2nd fortnight (30 days) no seedling height could be observed in seeds sown at 1.5 and 2.0 cm depth in the month of February. Maximum seedling height 4.63 cm was recorded in the seeds sown at 0.5 cm depth during the month of July where as seedling attained minimum height (1.06 cm) the seed sown in the 2.0 cm depth during the month of May. During 3rd fortnight i.e. after 45 days of seed sowing maximum seedling height (8.46 cm) was recorded in September sown seeds at 1.0 cm depth (Figure 2). It is also pertinent from the data that after 45 days of seed sowing the seedling depths irrespective of sowing months similar trend of seedling height was also observed after 60 days of sowing. it may be due to availability of favorable and unfavorable (High, Optimum & Low) environmental conditions at the time of growth and development of seedlings. Similar findings are observed by Barche *et al.*[2] under North Indian conditions in papaya.

**Seedling diameter**

Stem diameter of papaya seedling were recorded with digital vernier caliper at fort night intervals up to 90 days presented in Table 3 indicates that there was no considerable observation were recorded in each month i.e. February to Sept. after 15 days of sowing but after 30 days of sowing there is little increase in each month of sowing that range from 0.05 to 0.5cm. The highest stem diameter was observed in the June month of sowing and a considerable significant difference in stem diameter was observed in different depth of sowing i.e. at 0.5cm depth. The average stem diameter was 0.13cm, at 1.5cm depth average stem diameter is 0.2 and at 2.0cm depth, stem diameter was 0.4cm. A progressive increase in stem diameter was observed at 45 & 60 DAS. The maximum diameter was found in month of July & August due to favorable environmental condition up to 60 days. There was no significant difference observed in different depth of sowing. After 75 and 90 Days of sowing, the similar trend of increase in stem diameter was observed in every month of seed sowing but a significantly higher increase was observed in month of July in all the depth, while the minimum increase in stem diameter was record in month of February sowing as compared to other month of sowing. The factors responsible for seedling diameter may be temperature and nutrient up take by the seedlings, sun light etc. Similar results were observed by Babu *et al*.[1] and Barche *et al*[2].

**Number of leaves**

Data presented in Table 4 revealed that there was no significant effect was observed in number of leaves of papaya seedling in respect of the depth and time of sowing after 15 DAS but at 0.5cm depth there was appearance of 2 leaves in the month of July, August and September. There is a progressive increase in number of leaves in all the different depth & time of sowing except February seed sowing in which number of leaves ranges from 0 to 2 at different depth. Similar trend of increase in number of leaves was observed at 45, 60, 75 and 90 days after sowing. The maximum number of leaves per seedling was (18) in month of September, which was the maximum & minimum number of leaves (12) was observed in February month of sowing because in September month may be due to optimum temperature conditions for papaya growth and development whereas February month had very low temperature for growth and development almost seized the growth of plants. Similar observation by Barche *et.al.*[2] under North Indian conditions.

**Plate 3**: Showing the seed germination percentage and seedlings height of papaya seedlings cv. *Pusa Nanha*.

**Plate 4**: Showing the seedling height of papaya in polythene bags.

**Table 1: Effect of sowing time and seed depth on germination of papaya**

| Time of Sowing | (i) Initiation of germination | | | | | (ii)Days taken to complete germination | | | | | (iii) Percent germination (%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** |
| **Feb. 09** | 24.66 | 25.66 | 30.00 | 32.66 | **28.25** | 13.66 | 13.6 | 14.66 | 18.66 | **15.16** | 45.00 | 51.00 | 46.00 | 46.00 | **47.00** |
| **March 09** | 15.66 | 18.66 | 20.00 | 21.66 | **19.00** | 11.66 | 12.66 | 14.00 | 18.00 | **14.08** | 51.66 | 59.00 | 60.66 | 54.00 | **56.33** |
| **April 09** | 16.0 | 17.00 | 19.33 | 20.33 | **18.16** | 10.33 | 9.33 | 10.00 | 13.00 | **10.66** | 58.00 | 63.00 | 65.66 | 60.66 | **61.83** |
| **May 09** | 17.66 | 20.66 | 23.66 | 26.66 | **22.16** | 11.66 | 13.00 | 15.66 | 20.33 | **15.10** | 53.00 | 55.00 | 56.66 | 50.66 | **53.83** |
| **June 09** | 18.66 | 22.00 | 23.00 | 25.33 | **22.25** | 10.66 | 13.66 | 15.00 | 18.00 | **14.33** | 54.66 | 57.33 | 59.66 | 54.00 | **56.41** |
| **July 09** | 11.00 | 14.33 | 15.66 | 18.00 | **14.75** | 10.33 | 8.33 | 8.00 | 9.66 | **9.08** | 67.00 | 72.00 | 79.00 | 68.33 | **71.58** |
| **Aug. 09** | 12.00 | 15.66 | 18.00 | 20.00 | **16.41** | 8.66 | 8.00 | 8.00 | 9.00 | **8.41** | 67.66 | 70.00 | 74.33 | 66.00 | **69.50** |
| **Sept. 09** | 12.66 | 17.33 | 19.33 | 21.00 | **17.58** | 9.00 | 11.00 | 12.00 | 15.33 | **11.83** | 70.00 | 71.66 | 76.33 | 67.00 | **71.25** |
| **Mean** | **16.04** | **18.91** | **21.12** | **23.20** | | **10.75** | **11.20** | **12.16** | **15.25** | | **58.37** | **62.37** | **64.79** | **58.33** | |
| **CD at 5%** | A-0.57 | | B-0.80 | | AB- 1.61 | A-0.34 | | B-0.49 | | AB-0.98 | A-0.50 | | B-0.72 | | AB- 1.44 |

**A = Times of sowing B = Depth of sowing A x B = Times of sowing x Depth of sowing**

**Table 2: Effect of sowing time and seed depth on seedling height of papaya**

| Time of sowing | Seedling height (cm) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 DAS | | | | | 30DAS | | | | | 45DAS | | | | | 60DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** |
| **Feb. 09** | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 0.42 | 0.40 | 0.00 | 0.00 | **0.20** | 3.86 | 4.10 | 3.90 | 3.20 | **3.76** | 5.10 | 5.86 | 4.90 | 3.66 | **4.88** |
| **March09** | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 3.86 | 3.70 | 3.50 | 2.70 | **3.44** | 5.66 | 5.86 | 5.80 | 5.70 | **5.75** | 6.16 | 6.50 | 6.40 | 6.06 | **6.28** |
| **April09** | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 4.00 | 4.06 | 3.60 | 2.90 | **3.64** | 5.86 | 6.16 | 6.06 | 6.06 | **6.04** | 6.50 | 7.06 | 6.86 | 6.66 | **6.77** |
| **May 09** | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 2.86 | 2.86 | 2.06 | 1.06 | **2.21** | 5.96 | 6.50 | 6.26 | 6.20 | **6.23** | 6.90 | 7.43 | 7.06 | 7.03 | **7.10** |
| **June 09** | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** | 2.56 | 2.60 | 2.53 | 1.66 | **2.34** | 6.46 | 7.20 | 6.86 | 6.73 | **6.81** | 7.06 | 7.86 | 7.50 | 7.16 | **7.40** |
| **July 09** | 0.4 | 0.14 | 0.0 | 0.0 | **0.13** | 4.63 | 4.26 | 4.10 | 3.70 | **4.17** | 6.80 | 7.66 | 7.26 | 7.06 | **7.20** | 7.60 | 8.46 | 8.06 | 7.73 | **7.96** |
| **Aug. 09** | 0.36 | 0.0 | 0.0 | 0.0 | **0.0** | 4.10 | 4.33 | 3.90 | 3.50 | **3.95** | 7.46 | 8.10 | 7.86 | 7.56 | **7.75** | 7.96 | 9.06 | 8.66 | 8.20 | **8.47** |
| **Sept. 09** | 0.3 | 0.0 | 0.0 | 0.0 | **0.0** | 3.90 | 4.06 | 4.00 | 3.50 | **3.86** | 7.70 | 8.46 | 8.23 | 8.06 | **8.11** | 8.26 | 9.73 | 9.26 | 8.60 | **8.96** |
| **Mean** | **0.13** | **0.01** | **0.0** | **0.0** | | **3.29** | **3.28** | **2.96** | **2.37** | | **6.22** | **6.75** | **6.53** | **6.32** | | **6.94** | **7.75** | **7.34** | **6.89** | |
| **CD at 5%** | A-NS | | B-NS | | A×B-NS | A-0.03 | | B-0.04 | | A×B- 0.09 | A-0.04 | | B- 0.06 | | A×B 0.12 | A-0.04 | | B-0.06 | | A×B 0.12 |

**A = Times of sowing B = Depth of sowing A x B = Times of sowing x Depth of sowing**

**Contd…**

| Time of sowing | Seedling height (cm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 75 DAS | | | | | 90DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** |
| **Feb. 09** | 9.60 | 10.33 | 10.06 | 9.80 | **9.95** | 10.66 | 12.90 | 12.16 | 11.66 | **11.85** |
| **March09** | 10.13 | 12.16 | 00.166 | 10.66 | **11.15** | 10.96 | 13.23 | 13.06 | 12.30 | **12.39** |
| **April09** | 10.66 | 13.50 | 12.86 | 11.53 | **12.14** | 11.26 | 14.10 | 13.83 | 12.60 | **12.95** |
| **May 09** | 11.46 | 14.93 | 13.96 | 12.16 | **13.13** | 11.66 | 15.20 | 14.83 | 13.30 | **13.75** |
| **June 09** | 11.86 | 15.66 | 14.86 | 13.00 | **13.85** | 13.10 | 17.40 | 17.06 | 15.16 | **15.68** |
| **July 09** | 12.16 | 16.76 | 15.73 | 13.66 | **14.58** | 15.90 | 19.30 | 19.00 | 17.66 | **17.96** |
| **Aug. 09** | 13.40 | 17.53 | 16.56 | 14.86 | **15.59** | 16.20 | 19.93 | 19.50 | 18.10 | **18.43** |
| **Sept. 09** | 12.30 | 16.46 | 15.40 | 13.16 | **14.33** | 15.70 | 18.90 | 18.43 | 17.53 | **17.64** |
| **Mean** | **11.45** | **14.67** | **13.89** | **12.35** | | **13.18** | **16.37** | **15.98** | **14.79** | |
| **CD at 5%** | A-0.03 | | B-0.05 | | A×B- 0.10 | A-0.4 | | B-0.06 | | A×B- 0.13 |

**A = Times of sowing B = Depth of sowing A x B = Times of sowing x Depth of sowing**

**Table 3: Effect of sowing time and seed depth on seedling diameter of papaya**

| Time of sowing | Seedling diameter (cm) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 DAS | | | | | 30 DAS | | | | | 45 DAS | | | | | 60DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** |
| **Feb. 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.10 | 0.10 | 0.00 | 0.00 | **0.05** | **0.17** | 0.16 | 0.16 | 0.11 | **0.15** | 0.21 | 0.20 | 0.19 | 0.17 | **0.19** |
| **March09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.13 | 0.12 | 0.36 | 0.86 | **0.3** | **0.17** | 0.17 | 0.16 | 0.14 | **0.16** | 0.25 | 0.25 | 0.22 | 0.22 | **0.24** |
| **April 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.13 | 0.12 | 0.11 | 0.13 | **0.12** | **0.18** | 0.17 | 0.16 | 0.11 | **0.17** | 0.26 | 0.25 | 0.22 | 0.22 | **0.24** |
| **May 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.12 | 0.1 | 0.7 | 0.7 | **0.4** | 0.18 | 0.15 | 0.14 | 0.10 | **0.16** | 0.25 | 0.23 | 0.24 | 0.20 | **0.23** |
| **June 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.11 | 0.6 | 0.9 | 0.6 | **0.5** | 0.17 | 0.16 | 0.15 | 0.14 | **0.15** | 0.22 | 0.21 | 0.22 | 0.20 | **0.21** |
| **July 09** | 0.00. | 0.00. | 0.00. | 0.00. | **0.00.** | 0.16 | 0.13 | 0.16 | 0.12 | **0.1** | 0.19 | 0.18 | 0.19 | 0.17 | **0.18** | 0.27 | 0.25 | 0.24 | 0.23 | **0.25** |
| **Aug. 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.15 | 0.13 | 0.11 | 0.10 | **0.1** | 0.20 | 0.18 | 0.16 | 0.17 | **0.18** | 0.27 | 0.25 | 0.24 | 0.24 | **0.25** |
| **Sept. 09** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** | 0.15 | 0.14 | 0.13 | 0.90 | **0.3** | 0.19 | 0.18 | 0.17 | 0.16 | **0.17** | 0.26 | 0.24 | 0.24 | 0.23 | **0.24** |
| **Mean** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.13** | **0.1** | **0.2** | **0.4** | | **0.18** | **0.17** | **0.16** | **0.15** | | **0.25** | **0.23** | **0.23** | **0.21** | |
| **CD at 5%** | A-NS | | B-NS | | A×B- NS | A- 0.06 | | B- 0.09 | | A×B- 0.18 | A- 0.002 | | B- 0.004 | | A×B- 0.008 | A- 0.002 | | B- 0.003 | | A×B- 0.007 |

**Contd…**

| Time of sowing | Seedling diameter (cm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 75 DAS | | | | | 90DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** | **0.5** | **1.0** | **1.5** | **2.0** | **Mean** |
| **Feb. 09** | 0.29 | 0.28 | 0.26 | 0.24 | **0.27** | 0.40 | 0.40 | 0.37 | 0.36 | **0.38** |
| **March 09** | 0.34 | 0.32 | 0.34 | 0.31 | **0.33** | 0.46 | 0.44 | 0.45 | 0.42 | **0.44** |
| **April 09** | 0.35 | 0.33 | 0.33 | 0.34 | **0.34** | 0.46 | 0.44 | 0.43 | 0.41 | **0.43** |
| **May 09** | 0.33 | 0.32 | 0.30 | 0.28 | **0.30** | 0.44 | 0.44 | 0.41 | 0.42 | **0.43** |
| **June 09** | 0.32 | 0.30 | 0.29 | 0.27 | **0.29** | 0.44 | 0.43 | 0.40 | 0.44 | **0.43** |
| **July 09** | 0.40 | 0.38 | 0.38 | 0.37 | **0.38** | 0.50 | 0.49 | 0.48 | 0.46 | **0.48** |
| **Aug. 09** | 0.39 | 0.38 | 0.35 | 0.34 | **0.36** | 0.49 | 0.47 | 0.46 | 0.45 | **0.47** |
| **Sept. 09** | 0.40 | 0.38 | 0.36 | 0.36 | **0.37** | 0.47 | 0.45 | 0.45 | 0.44 | **0.45** |
| **Mean** | **0.35** | **0.34** | **0.33** | **0.32** | | **0.46** | **0.45** | **0.43** | **0.43** | |
| **CD at 5%** | A-0.002 | | B-0.004 | | A×B- 0.008 | A-0.002 | | B-0.04 | | A×B- 0.008 |

**A = Times of sowing B = Depth of sowing A x B = Times of sowing x Depth of sowing**

**Table 4: Effect of sowing time and seed depth on number of leaves per seedling of papaya**

| Time of sowing | No. of leaves per seedling | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 DAS | | | | | 30 DAS | | | | | 45 DAS | | | | | 60DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | 0.5 | 1.0 | 1.5 | 2.0 | Mean | 0.5 | 1.0 | 1.5 | 2.0 | Mean | 0.5 | 1.0 | 1.5 | 2.0 | Mean | 0.5 | 1.0 | 1.5 | 2.0 | Mean |
| **Feb. 09** | 0 | 0 | 0 | 0 | **0** | 2 | 2 | 0 | 0 | **1** | 4 | 4 | 4 | 4 | **4** | 6 | 6 | 6 | 4 | **5.5** |
| **March09** | 0 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 4 | **4** | 6 | 6 | 6 | 6 | **6** | 8 | 8 | 8 | 8 | **8** |
| **April 09** | 0 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 4 | **4** | 6 | 6 | 6 | 6 | **6** | 8 | 8 | 8 | 8 | **8** |
| **May 09** | 0 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 2 | **3.5** | 8 | 8 | 8 | 8 | **8** | 8 | 8 | 8 | 8 | **8** |
| **June 09** | 0 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 2 | **3.5** | 8 | 8 | 8 | 8 | **8** | 8 | 8 | 8 | 8 | **8** |
| **July 09** | 2 | 2 | 0 | 0 | **1** | 4 | 4 | 4 | 4 | **4** | 8 | 8 | 8 | 8 | **8** | 8 | 8 | 8 | 8 | **8** |
| **Aug. 09** | 2 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 4 | **4** | 8 | 8 | 8 | 8 | **8** | 8 | 10 | 10 | 8 | **9** |
| **Sept. 09** | 2 | 0 | 0 | 0 | **0** | 4 | 4 | 4 | 4 | **4** | 8 | 8 | 8 | 8 | **8** | 8 | 10 | 10 | 10 | **9.5** |
| **Mean** | **0.7** | **0.2** | **0** | **0** | | **3.7** | **3.7** | **3.5** | **3.0** | | **7.0** | **7.0** | **7.0** | **7.0** | | **7.7** | **8.2** | **8.2** | **7.7** | |
| **CD at 5%** | A-NS | | B-NS | | A×B -NS | A-NS | | B-NS | | A×B –NS | A-NS | | B-NS | | A×B-NS | A-NS | | B-NS | | A×B-NS |

**Cont…**

| Time of sowing | No. of leaves per seedling | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 75 DAS | | | | | 90DAS | | | | |
| | Depth's of sowing (cm) | | | | | Depth's of sowing (cm) | | | | |
| | 0.5 | 1.0 | 1.5 | 2.0 | Mean | 0.5 | 1.0 | 1.5 | 2.0 | Mean |
| **Feb. 09** | 10 | 10 | 10 | 10 | **10** | 12 | 12 | 12 | 12 | **12.0** |
| **March09** | 10 | 12 | 12 | 12 | **11.5** | 12 | 14 | 14 | 14 | **13.5** |
| **April09** | 12 | 12 | 12 | 12 | **12** | 14 | 16 | 14 | 14 | **14.5** |
| **May 09** | 12 | 14 | 14 | 12 | **13** | 14 | 16 | 16 | 14 | **15.0** |
| **June 09** | 12 | 16 | 16 | 14 | **14.5** | 16 | 18 | 18 | 16 | **17.0** |
| **July 09** | 14 | 16 | 16 | 14 | **14.5** | 16 | 18 | 18 | 16 | **17.0** |
| **Aug. 09** | 14 | 18 | 16 | 14 | **15.5** | 16 | 18 | 18 | 16 | **17.0** |
| **Sept. 09** | 14 | 16 | 16 | 16 | **15.5** | 16 | 18 | 18 | 18 | **17.5** |
| **Mean** | **12.2** | **14.2** | **14.0** | **13.0** | | **14.5** | **16.6** | **16.0** | **15.0** | |
| **CD at 5%** | A-NS | | B-NS | | A×B –NS | A-NS | | B-NS | | A×B -NS |

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