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# EFFECT OF TRANSPLANTING DATE ON THE PHYSIOLOGICAL PERFORMANCE OF *PUERARIA TUBEROSA* (ROXB. EX. WILD) DC.

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## ABSTRACT

*For optimization of better yield from a crop, transplanting at the appropriate time to fit the physiological growth period is critical. A study was carried out in a time period of July 2015 to June 2016 to determine the best planting spell for the Pueraria tuberosa (Rox. Ex. Wild) DC. In the study, tubers of Pueraria tuberosa were planted in mid of every months from July, 2015 to June, 2016. The highest plant height was attained in plants transplanted on September 15$^{th}$, 2015 (T3), followed by those on July 15$^{th}$ , 2015 (T1) and August 15$^{th}$ , 2015 (T2) respectively. The information generated here in the study seems to be useful for making varying transplanting decisions for Pueraria tuberosa with shifting maturity times.*

**Keywords:** *Pueraria tuberose,* date of Transplanting; physiological growth, and yield

## INTRODUCTION

Indian Kudzu or *Pueraria tuberosa* (Rox. Ex. Wild) DC is one among a number of plants that have been proved to have potential pharmacological properties in Indian traditional and folklore system of medicine (Ayurveda and Siddha). The herb is found throughout in India except in very humid or very arid regions up to 1200 m (Malviya et al, 2016). Its tuber is popularly used as active component in various formulations in Indian therapeutic system. It has been used as an aphrodisiac, cardiotonic, diuretic, anti-carcinogen, anti-diabetes, hypolipidemic (Tanwar et al. 2008), and antioxidant under *in vitro* and *in vivo*

condition (Verma et al. 2009). Traditionally, the tubers have been in practice against pain, inflammations, burning sensations and skin problems (Puri, 2003). The tubers have also curative effects on cough, rheumatism, malarial fever and promote secretion of milk in woman (Juyal and Ghildiyal, 2013). It is a constituent of various formulations used as nutritive, diuretic, expectorants, and for the management of rheumatism, fever, and bronchitis (Pandey et al., 2007 ). *P. tuberosa* tubers are rich in isoflavonoids and the important phytoconstituents are puerarin, daidzein, genistein, puetuberosanol, and tuberosin ( Khan et al., 1996).

Such promising data on the enriched bioactive molecules in the tubers of *Pueraria tuberosa* fetches wider attention of plant scientists to expedite its agronomic prospects of advancement. Agronomic improvement of the herb will certainly establish efficacy of their use as nutraceutical. Hence, the present study was undertaken to optimize the month of transplanting with respect to major growth attributes of plants.

## MATERIAL & METHODS

Field experiments were conducted during July 2015 to April 2016 at Daluwala Mazafta village near Roorkee (District-Haridwar, Uttarakhand) on 29.85° N altitude and 77.89° E longitude to study the effect of different date of transplanting on the growth and survival attributes. The experiment was laid out in Randomized block design with four replications. 12 different dates of transplanting *viz*., July, 15$^{th}$, 2015 (T1), August, 15$^{th}$, 2015 (T2), September, 15$^{th}$, 2015 (T3), October, 15$^{th}$, 2015 (T4), November, 15$^{th}$, 2015 (T5), December, 15$^{th}$, 2015 (T6), January, 15$^{th}$, 2016, February, 15$^{th}$, 2016 (T7), March, 15$^{th}$, 2016 (T8), April, 15$^{th}$, 2016 (T9), May, 15$^{th}$, 2016 (T10), June, 15$^{th}$, 2016 (T11), and July, 15$^{th}$, 2016 (T12), with the spacing of 1 ×1m and 30 kg FYM /plot accommodating 20 tubers/ plot. The tubers along with 10 to 15 cm stem of *P. Tuberosa* uprooted from nearby forest area (Rajaji National Park) were transplanted on the same day. The average weight of each tuber was 500 g. to 750 g. The experimental observations were made on major growth attributes such as plant height (cm), No. of leaves per plants, and thickness of stem (mm) of flowering plants.

### Statistical Analysis

The data obtained from experiments were analyzed by the 'F' test for significance following the method Factorial Randomized Block Design as described by Panse and

Sukhatme. 1985. Wherever necessary, the percent values were transformed to angular (Arc-sine) values before analysis. The critical differences (CD) were calculated at 5 per cent probability level. The data were tested for statistical significance.

## RESULT & DISSCUSSION:

1. **Number of Leaf per plant**

Number of Leaf per plant observed after transplanting observed after transplanting were observed against different dates from July 15th 2015 (T1) to June 15th 2016 (T12) and has been presented in table 1.1

Table 1.1 No. of Leaf per plant observed after transplanting on different dates (T1-T12)

| T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18.467 | 21.067 | **24.133** | 12.067 | 12.667 | 13.867 | 19.067 | 14.533 | 12.400 | 6.800 | 4.200 | 2.267 |

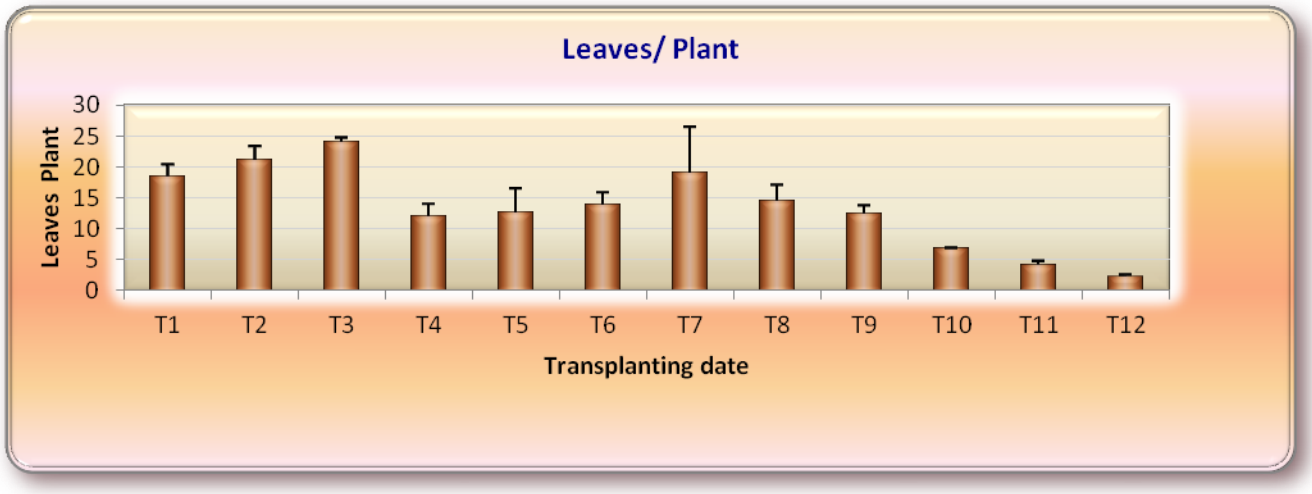

**Fig: 1.1** No. of Leaf per plant observed after transplanting on different dates (T1-T12)

**Table 1.2 ANOVA for Number of leaves/ Plant**

| Source of Variations | df | Sum of Squares | Mean Squares | F Ratio | Probability | | □² | □p² | □² |
|---|---|---|---|---|---|---|---|---|---|
| Replicates | 2 | 65.982 | 32.991 | 1.545 | 0.236 | | 0.033 | 0.123 | 0.011 |
| Transplanting date | 11 | 1466.066 | 133.279 | 6.243 | 0.000 | *** | 0.732 | 0.757 | 0.355 |
| Error (A) | 22 | 469.698 | 21.350 | | | | | | |
| Total | 35 | 2001.745 | 57.193 | | | | | | |

| Comparison | Std. Error | S.E. Difference | t value | C. Difference |
|---|---|---|---|---|
| Ai.- Aj. (Transplanting date) | 2.668 | 3.773 | 2.074 | 7.824 |

## 2. Plant height

Plant height (cm) observed after transplanting were observed against different dates from July 15$^{th}$ 2015 (T1) to June 15$^{th}$ 2016 (T12) and has been presented in table 2.1

Table 2.1: plant height observed after transplanting on different dates (T1-T12)

| T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 132.533 | 132.067 | **135.733** | 73.067 | 75.133 | 83.867 | 40.867 | 59.400 | 43.733 | 13.400 | 6.667 | 4.000 |

**Table 2.2: ANOVA for Plants height (cm)**

| Source of Variations | df | Sum of Squares | Mean Squares | F Ratio | Probability | | □² | □p² | □² |
|---|---|---|---|---|---|---|---|---|---|
| Replicates | 2 | 1157.509 | 578.754 | 1.564 | 0.232 | | 0.014 | 0.124 | 0.005 |
| Transplanting date | 11 | 76209.241 | 6928.113 | 18.719 | 0.000 | *** | 0.891 | 0.903 | 0.446 |
| Error (A) | 22 | 8142.251 | 370.102 | | | | | | |
| Total | 35 | 85509.000 | 2443.114 | | | | | | |

| Comparison | Std. Error | S.E. Difference | t value | C. Difference |
|---|---|---|---|---|
| Ai.- Aj. (Transplanting date) | 11.107 | 15.708 | 2.074 | 32.576 |

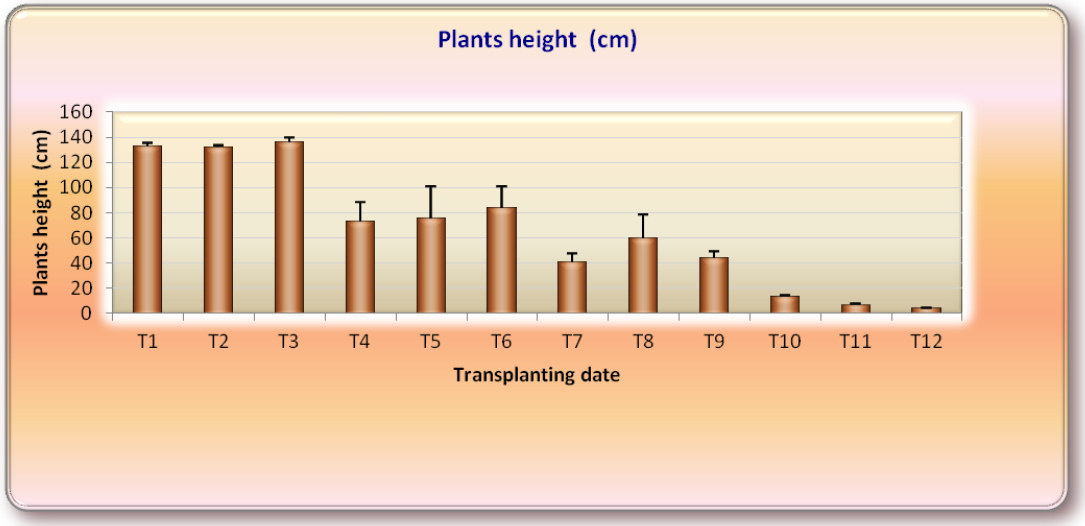


**Fig: 2.1** Plant Height observed after transplanting on different dates (T1-T12)

### 3. Plants diameter followed by transplanting date

Plant diameter measured after transplanting against following dates against different dates from July 15$^{th}$ 2015 (T1) to June 15$^{th}$ 2016 (T12) and has been presented in table 3.1

Table 3.1: Plant diameter measured against different transplanting dates

| T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **4.640** | 4.380 | 4.197 | 3.863 | 4.187 | 3.920 | 3.443 | 3.733 | 2.903 | 2.211 | 0.827 | 0.598 |

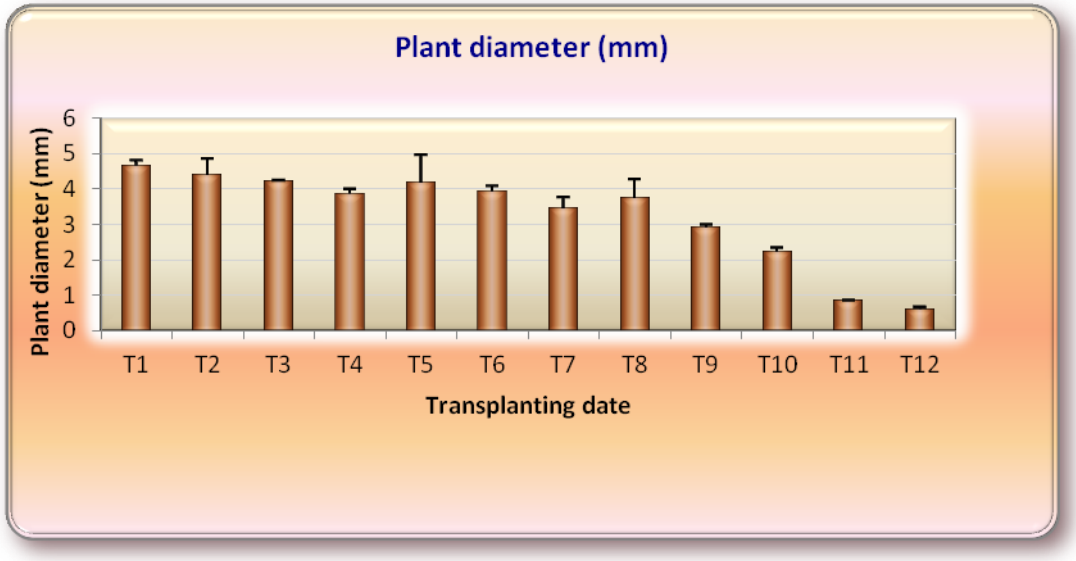


**Fig: 3.1** Plant diameters measured against different transplanting dates

**Table 3.2: ANOVA for Plant diameter (mm)**

| Source of Variations | df | Sum of Squares | Mean Squares | F Ratio | Probability | | □² | □p² | □² |
|---|---|---|---|---|---|---|---|---|---|
| Replicates | 2 | 0.980 | 0.490 | 1.740 | 0.199 | | 0.014 | 0.137 | 0.006 |
| Transplanting date | 11 | 60.547 | 5.504 | 19.556 | 0.000 | *** | 0.894 | 0.907 | 0.448 |
| Error (A) | 22 | 6.192 | 0.281 | | | | | | |
| Total | 35 | 67.719 | 1.935 | | | | | | |

| Comparison | Std. Error | S.E. Difference | t value | C. Difference |
|---|---|---|---|---|
| Ai.- Aj. (Transplanting date) | 0.306 | 0.433 | 2.074 | 0.898 |

Appropriate and proper time of transplanting is one of the basic requirements for having good harvest from any crop. As emphasized by Snoek (1981), the total yield of the crop is markedly influenced by different transplanting times. This must be on account of environmental conditions particularly the light, humidity and temperature interacting with genetic system and elicit developmental changes during physiological growth, which exert influence on overall maturity. In the present study, maximum number of leaves (24.133) emerged in the plants those were transplanted in September 15$^{th}$, 2015 (T3) followed by 21.067 leaves in August 15$^{th}$, 2015 (T2) and 19.067 leaves in February 15$^{th}$, 2016 (T7). With respect to plant height, T3 resulted as maximum (135.733 cm) followed by T1 (132.533 cm) and T2 (132.067 cm) respectively while plants under T1 attained maximum diameter 4.640 mm) followed by T2 (4.380 mm) and T3 (4.197 mm) respectively. These results could be due to availability of adequate soil and environmental moisture in complementation with moderate contributing good physiological growth of the transplanted tubers.

## CONCLUSION

From the present study, it could be concluded that the tubers of *Pueraria tuberosa* transplanted on September 15th, 2015 recorded the maximum number of leaves as well as maximum height with considerable stem thickness. Hence, September 15$^{th}$ November could be considered suitable for *Pueraria* transplantation.

Further study is envisaged to correlate the aerial growth with respect to the yield and puerarin content of tubers to conclude the best treatment (month) of transplantation for its commercial scale production. Authors are very grateful to the National Medicinal Plants Board, (NMPB) New Delhi for providing financial assistance.

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