

DETERMINATION OF TRANSPLANTED SEEDLINGS AGE ON YIELD AND YIELD COMPONENT OF TOBACCO

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ABSTRACT

*In order to study the effects of seedling age on yield and yield components of tobacco (*Nicotiana tabacum* L.), a field experiment was carried out in the field of Bilatie tobacco farm in the period of 2014–2015. Experimental design was arranged in Randomized Completely Block design with three replications. Results showed that the effect of seedling age on plant height, leaf length, width, stem diameter per plant and green leaves yield per plot was significant at 0.05 probability levels. Early seedling age 6- 11 weeks or 45-77days were produced larger leaves, greater number of leaves, more stem diameter per plant, higher green leaf yield per plot, grew taller and less exposed to virus diseases than the seedlings transplanted at (12 - 14 weeks) or (84- 94 days). It is recommended that tobacco should not be left beyond 12 weeks or 84 days in nursery before transplanting for optimum performance.*

Key words: tobacco, green leaf yield, seedling age, yield component

INTRODUCTION

Plant growing factors influencing the field performances of the tobacco variety at Bilatte are various; some are varietal, others are technological, biotic and abiotic factors (Abebe and Shiferaw, 2020). In order to increase tobacco productions effects are being made using improved cultural practices. Among improved cultural practices, seedling age remarkable influence on yield and yield component of tobacco, have often varied with varieties and locations. When tobacco seedling transplanted at the right time, requires a longer growing period for obtaining an optimal green leaf yield and reduced cost of production. On the other hand, if the age of seedling is more than optimum, the seedling produce less agronomic growth parameters and exposed to disease and insect pest. A review of the literature on for growing plants for field transplanting tomato, onion, cabbage and pepper (5-7),(10-12), (5-7) and (6-8) weeks respectively (Lorenz and Maynard, 1988). Lorenz and Maynard, (1988). Lou et al., (1993) indicated that younger eggplant grew more vigorously after transplanting and yielded greater than older seedlings in China. Different transplants age differs for each crop depending on various factors such as light, temperature, CO₂, air humidity, fertilization, substrate and cultivation methods (Ciardi *et al.*, 1998; Vavrina, 1998; Damato and Trotta, 2000).

Bilatte leaf development farm in Ethiopia do not give due attention to the age of seedling at transplanting time and traditional time frame for transplanting practice varies from location to season. So, There is need for more information on this in order to determine the optimum age for successful tobacco production. In view of above facts, therefore, these purposeful projects have been implemented to determine the effect of different seedling age on the yield and yield components of tobacco cv. K-110.

MATERIAL AND METHODS**EXPERIMENTAL SITE/ LOCATION**

The field study was conducted at Bilatte tobacco farm during wet and dry seasons in 2014/15 with a view of find out the effect of seedling age of tobacco on yield and yield components. The soil of the experiment field was loam soil texture (40% sand, 25% clay, and 35% loam) with an average pH of 7.09, total carbon 1.05% and nitrogen 0.084% (Landon, 1991).. Meteorological data shows (Table 1) that mean maximum temperature in 2012- 2014 cropping season were 30.7, minimum temperature 16.4° c and mean precipitation were 1890.4 mm rained for total 152 days. There are two cropping seasons in the study area, i.e., the short rainy season occurs from the beginning of March to the end of June, the main rainy season starts June/July and continues to the end of September and the dry spell between November and February.

Table 1: 2012/13 metrological data at Bilatte tobacco farm

Cropping seasons	temperature		Rainfall total(mm)	No of day it rained
	max	min		
2012	30.7	16.4	7189.95	25
2013	30.2	16.7	1188.1	29
2014	30.9	17.1	702.3	98
Mean /total	30.7	16.4	1890.4	152

Source: Bilatte metrology station

EXPERIMENTAL DESCRIPTION

The experiment was laid out in randomized complete block design (RCBD) with three replicates; the plot size was kept four rows (7 plants per row) with spacing of 0.55 m between plant and 1.10m between rows. The treatments consisted nine seedling ages viz. 6, 7, 8, 9, 10, 11, 12, 13 and 14 weeks. Fuel cured tobacco variety k-110 variety was used in the trial.

Transplanting

The trial period of 2014 cropping wet season, transplanting dates range 15 May to 24 June, for dry season 2014/15 range 28 November to 8 January.

Cultural practice

Land preparation was done for transplanting. Weeding and irrigation made regularly.

Data collection**Leaf length and width (cm)**

Leaf length and width from selected five plants were measured from lower, middle and top leaves with help of measuring tape.

Plant height (cm)

Data on plant height (cm) was calculated with help of measuring tape and plant height (cm) was measured from the soil surface to the top of the plant and average was worked out.

Stem diameter (cm)

Stem diameter was measured with tape.

Number of leaves per plant

Numbers of leaves were determined by counting the leaves per plant, in selected samples

Green leaves yield (kg/plot)

Green leaves yield per plot was determined by weighting the collected green leaves from each plot

Disease reaction

Disease reaction calculated by the following formula:-

$$\% \text{ incidence} = \frac{\text{No of diseased plant}}{\text{No of plant in plot}} \times 100$$

Data analysis

Analysis of variance ANOVA was used to analyses the data and mean exhibiting significance Difference were compared by using (LSD) least significant difference at 5% level of significance (SAS, 2003).

RESULTS

Effects of seedling age on yield and growth parameters

PLANT HEIGHT (CM):- Seedling age had significant influence on plant height. The tobacco plants whose seedlings were transplanted at 4 week after sowing were the tallest (1.33 m), while the tobacco plants whose seedlings were transplanted at 14 week's old seedling were the shortest (0.98m) (Table 2).

NUMBER OF LEAVES PER PLANT :- The tobacco plants whose seedlings were transplanted at 6 week after sowing had the produced more leaves per plant(25.67) while those whose seedlings were transplanted at 14 week after sowing produced the least number of leaves per plant(14.1) (Table2)

LEAF LENGTH AND WIDTH (CM):-The results showed that tobacco plants with young seedlings were transplanted dates had significant effect ($P \leq 0.05$) on leaf length and width. Bigger leaf length and width were recorded on plants whose seedlings were transplanted at early age 6 weeks after sowing (72.59) and (47.9 cm) respectively. The least leaf length and width on plant seedlings were transplanted late 14 weeks after sowing (51.00) and (26.90cm) respectively (Table 2).

STEM DIAMETER (CM):- The result (Table 2) showed that variations in the relative seedling age of tobacco pepper had significant effect ($P \leq 0.05$) on stem diameter at 12, 13 and 14 weeks after transplanting but had no significant effect at 7,8, 9, 10 and 11 Week after sowing.

TOBACCO GREEN LEAF YIELD (KG/PLOT):- Statistical analysis of results showed that variations in the relative seedling age of tobacco had significant effect ($P \leq 0.05$) on green leaf yield. Transplanting of tobacco seedling (6–11 weeks) obtaining an optimal yield. While, when transplanting older seedling (12–14 weeks) their yield were low. The tobacco plants transplanted at 6 week after sowing recorded the highest green leaf weight (kg/plot) compared to those transplanted at 13 and 14 week after sowing.

Table 2: Combined analysis of seedling age effect on growth parameters of tobacco at Bilatte 2014/15

Ages of seedling (weeks)	Plant height per plant (cm)	Number of leaves per plant	Leaf Length(cm)	Leaf width (cm)	Stem diameter (cm /plant)	Yield (kg/plot)
6 weeks (42 days)	1.33a	25.67a	72.59a	47.9a	4.36a	65.90a
7weeks (49 days)	1.31b	24.55b	71.93a	44.23ab	4.26a	64.90b
8 weeks (56 days)	1.30c	23.78c	69.66a	43.93ab	4.20a	50.56de
9 weeks (63 days)	1.30c	22.66d	68.66ab	42.56ab	4.13a	50.30e
10 weeks (70 days)	1.24d	21.28e	67.66ab	41.90ab	4.03a	51.63c
11 weeks (77 days)	1.15e	21.28e	65.66abc	40.90ab	4.03a	51.30cd
12 weeks (84 days)	1.14f	21.22f	64.33abc	38.23b	3.16c	45.23f
13 weeks (91 days)	1.10g	17.7g	52.66bc	27.23c	3.56b	28.30g
14 weeks (98 days)	0.98h	14.17h	51.00c	26.90c	2.46d	25.30h
CV (%)	12.39	17.05	14.16	16.77	6.05	0.92

Figures in a column with similar letter (s) do not differ significantly at 5% level of probability using DMRT. (Own data)

Diseases incidence:-low resistance to disease is observed on seedlings transplanted late 12-14 week after transplanted for mosaic virus and bushy top virus. Tobacco seedling transplanted before 12 weeks old seedling recorded > 35% bushy toppy, and no mosaic virus disease

incidence (Figure

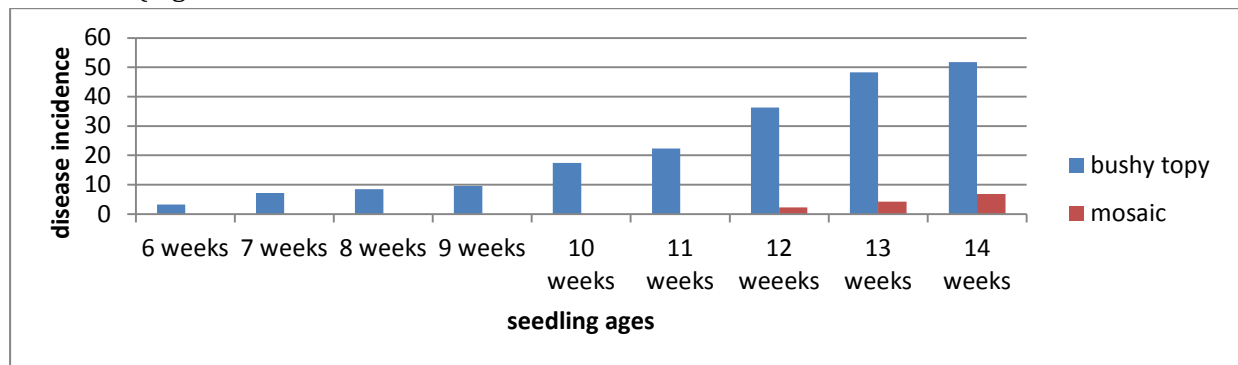


Figure 1: Effect of seedling on disease development

DISCUSSIONS

The variations in relative sowing dates of tobacco showed that the tobacco plants transplanted at 6 and 7 week after sowing established and grew well on the field due to early transplanting compared to the tobacco plants transplanted at 12, 13 and 14 week after sowing. From trial data observed that variations in relative seedling ages of tobacco showed that the tobacco plants transplanted at early stages (6-11 weeks) established grew well was better in performance especially in plant height, leaf size, green leaf yield and less exposed to disease and then those compared to transplanted at 12-14 weeks that poor performance of tobacco may be attributed in part to poor early growth. Our result is in line with trial conducted on tomato young transplants (3 to 4 weeks) reduces production costs, and will need to be grown longer in the field to reach optimum yield (Hoffman, 1929; Leskovar et al., 1991; Orzolek et al., 1991). Similar result also observed on pepper that pepper transplants of 8 to 11 weeks may have a yield advantage for early size and number of fruit (McCraw and Greig, 1986; Nicklow, 1963; Weston, 1988).

CONCLUSION

Based on the findings of this study, the following conclusions were made:

- ✓ from our trial we concluded that (6-11 weeks) or (42- 77 days) seedling was better vegetative growth, green leaf yield and were less exposed to diseases than those of relatively older seedling (12, 13 and 14 weeks) or (84, 91 and 98 days).
- ✓ Tobacco seedling transplant age of 12, 13 and 14 weeks (84, 91 and 98 days) have less vegetative growth, green leaf yield and were more exposed to diseases than early transplanted 6-11 weeks (42-77 days)

RECOMMENDATION

It was recommended that ideal seedling age for tobacco should be 6-11 weeks (42- 77days) to ensure better growth and yield. After 12 weeks both diseases incidence increased. Therefore, in order to reduce incidence of disease one of cultural control method using early transplanted seedling of tobacco. Tobacco seedling transplanting should not be carried out later than 12 weeks (84days) in Bilatte condition.

REFERENCES

1. Ciardi J. A., Vayrina, C.S., Oriole M. D. (1998). Evaluation of tomato transplant production methods for improving establishment rates. *Horticulture Science*, 33 (2), 229-232.
2. Damato, G., Trotta, L. (2000): Cell shape, transplant age, cultivars and yield in broccoli. *Acta Horticulture* 533: 145-152

3. Handley, D., Hutton, M. (2003). Effect of seeding date, transplant size and container on growth and yield of pickling cucumbers. *J. Amer. Soc. Hort. Sci.*, 38, 672
4. Henare, M., Ravanloo, A. (2008). Effect of transplanting stage and planting depth of seedling on growth and yield of tomato. *Book of abstracts. IV Balkan Symposium on Vegetables and Potatoes. Plovdiv*, 96.
5. Hoffman, I.C. (1929). Time of sowing tomato seed for spring crop. *Ohio Agr. Expt. Sta. Bul.* 431:90- 91.
6. Landon, J.R. (1991). *Booker tropical soil manual: A handbook for soil survey and agricultural land evaluation in the tropics and subtropics.* Longman Scientific and Technical, Essex, New York 474p.
7. Leskovar, D.I., Cantliffe, D.J., Stoffella, P.J. (1991). Growth and yield of tomato plants in response to age of transplants. *J. Amer. Soc. Hort. Sci.* 116(3):416 -420.
8. Lorenz, O.A., Maynard, D.N. (1988). *Knott's handbook for vegetable Growers* 3rd ed. Wiley, New York
9. Lou, H.N., Kato, T., Toru, K. (1993). Influence of seedling age on endogenous hormones, seedling quality and productivity in eggplant. *Acta Hort.* 20:257 - 260 (Chinese).
10. McCraw, B.D., Greig, J.K. (1986). Effect of transplant age and pruning procedure on yield and fruit -set of bell pepper. *Hort Science* 21(3):430 – 431
11. Orzolek, M.D., Vavrina, C.S., Scott, R. (1991). Tomato transplant age study. *Panama State 1990- 91 Veg. Res. Rpt. Hort. Mimeo Ser. II: 1-95.*
12. Schrader, W.L. (2000): *Using transplant in vegetable production.* Univ. Calif. Div. Agr. Natural Resources. Publ. 8013
13. *Statistical Analysis System, SAS,(2003): SAS user's guide statistics 2003 ed.* Statistical Analysis System Institute, version 9.0, Cary, N.
14. Vavrina, C.S. (1998): Transplant age in vegetable crops. *Horticulture Technology*, 8 (4), 550–555.
15. Weston, L.A. (1988). Effect of flat cell size, transplant age and production site on growth and yield of pepper transplants. *Hort Science* 22(4):709- 711.