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DETERMINATION OF VEGETATIVE DEVELOPMENT AND FLOWER EFFECT OF TRANSGENIC *NICOTIANA TABACUM*

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Abstract
Species and varieties in the Nicotiana genus may respond differently to photoperiodism in terms of flowering time control. These are classified as short day, neutral day and long day plants. One of these, Nicotiana tabacum cv. The Xanthi nc is a genotype which can flowering on a long day. But the genotype Kanamycin resistance can open its flowers in January when the resistance gene is transferred to the plant. On the other hand, the effect of rootstock to scion in plant species is very important. One of the issues raised is whether the transgenic plant in the rootstock is effect of transgen. In this study, it was aimed to determine whether flowering of the plants carrying transgenic plants are effective for flowering. In the study, control was grown without grafting, transgenic and control plants were reciprocally grafted and flowering time and plant development was recorded. According to the findings obtained, no effect of reciprocally grafted was observed in terms of flowering and plant development. However, it has come to the conclusion that it need detailed study to understand whether signal goes from rootstock to scion.

Keywords: flowering, grafting, tobacco.

1. INTRODUCTION

Seasonal events play significant roles in life cycle of several plant species. Seed germination, flowering, bud dormancy and break out of dormancy are important developmental stages of plants, mostly associated with day-length and temperature.

In a 24-hour night and day cycle, the plant physiological response to day (light) and night (dark) periods is defined as photoperiodism. The photoperiodism allows a physiological process to happen at certain period of the year. Plants are classified based on their photoperiodic responds and such a classification is generally made based on flowering. Plants are classified photoperiodically in three groups. Short-day (long-night) plants only blossom under short day conditions at the end of summer, autumn or winter when days are short. And long-day (Short-night) plants blossom only under long-day conditions at the end of spring and beginning of summer. Several cereal species, spinach, radish, lettuce and iris-like belong to long-day plants. Neutral-day plants blossom independent of day length such as beans, tomato, and dandelion.

There is important variation between and within plant species with regard to flowering time such as *Nicotiana* genus. Species and varieties in the *Nicotiana* genus may respond differently to photoperiodism in terms of flowering time control. These are classified as short day, neutral day

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and long day plants. One of these, *Nicotiana tabacum* cv. The Xanthi nc is a genotype flowering on long-day. The objective of the study was to determine whether the transgene has any effect on flowering time of the plants.

2. MATERIALS AND METHODS

For grafting 1. Xanthi cultivar (Nicotiana tabacum) wild type, 2. Transgenic Xanthi cultivar (Nicotiana tabacum) were used. The two genotypes were reciprocally grafted (*Nicotiana tabacum* cv. The Xanthi nc X Wild Type, and Wild Type X *Nicotiana tabacum* cv. The Xanthi nc) used. Experiments were conducted at a climate controlled greenhouse using three replications with 5 plants at each replication. In the study, control was grown without grafting, transgenic and control plants were reciprocally grafted and flowering time and plant development was recorded. Grafting was done 30 day after sowing. And leaf width (cm), leaf length (cm), gap between leaf (cm), plant height (cm) were measured 55-day after grafting.

3. RESULTS AND DISCUSSIONS

Seasonal flowering is an important adaptive trait in plants for reproductive success. Plants monitor day length in the leaf to anticipate upcoming seasonal changes and initiate floral morphogenesis at the shoot apex by the action of the leaf-generated mobile florigen (Imaizumi and Kay, 2006; Zeevaart, 1976). Grafting experiments have shown that florigen is transmissible from a donor plant that has been subjected to inductive day length to an un-induced recipient plant (Notaguchi et. al. 2008). In this study, reciprocal grafting was carried out, and leaf width (cm), leaf length (cm), gap between leaf (cm), plant height (cm) and flowering time were recorded (Table 1). According to the measurements, even though there were some differences with regard to plant development parameters, reciprocal grafting did not show significant differences in terms of flowering time and plant development (Figure 1).

Table 1. Leaf width (cm), Leaf length (cm), Gap between leaf (cm), Plant height (cm) and flowering time of grafted plants

Rootstock	Shoot	Leaf width (cm)	Leaf length (cm)	Gap between leaf(cm)	Plant height(cm)	Flowering in time
Wilt Type	Giant	18.4	38.8	2.0	59.0	No
Giant	Wilt Type	13.9	21.5	4.5	99.0	Yes

The transition from vegetative growth (the production of leaves) to flowering is the major developmental switch in the plant life cycle. The timing of flower initiation is critical for reproductive success; flowering and subsequent seed development must be completed during favorable growing conditions. Many plant species have therefore evolved the ability to initiate flowering in response to environmental cues such as changes in day length (photoperiod) and temperature (Amasino, 1996). Owing to their utilization of the vigorous root system of the rootstocks, grafted plants usually show increased uptake of water and minerals when compared with self-rooted plants (Lee and Oda, 2003). Research has shown that possible mechanisms for increased yield are likely the result of increased water and nutrient uptake by vigorous rootstock genotypes. Uptake of macronutrients such as phosphorus and nitrogen was enhanced by grafting (Ruiz and Romero, 1999, Giuffrida, 2006).

Grafting has several benefits such as; efficient control of soil-born diseases such as *Fusarium* and *Verticillium*; tolerance to low soil and air temperatures; more efficient water and nutrient uptake and

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use; improved yields due to prolonged harvest durations; increase in standard marketable product quantities; rootstock-induced resistance to diseases; removal of tolerance to low temperature and negative soil conditions from breeding programs and thus shortened breeding programs; better nutrient uptake and reduced environmental impacts. In this study, effects of grafting on flowering, rather than vegetative development, were investigated and it was expected that transgenic Nicotinea rootstocks was supposed to send a signal to grafted material and delay flowering. However in reciprocal grafting, despite the differences in plant development, expected impacts on flowering were not observed.

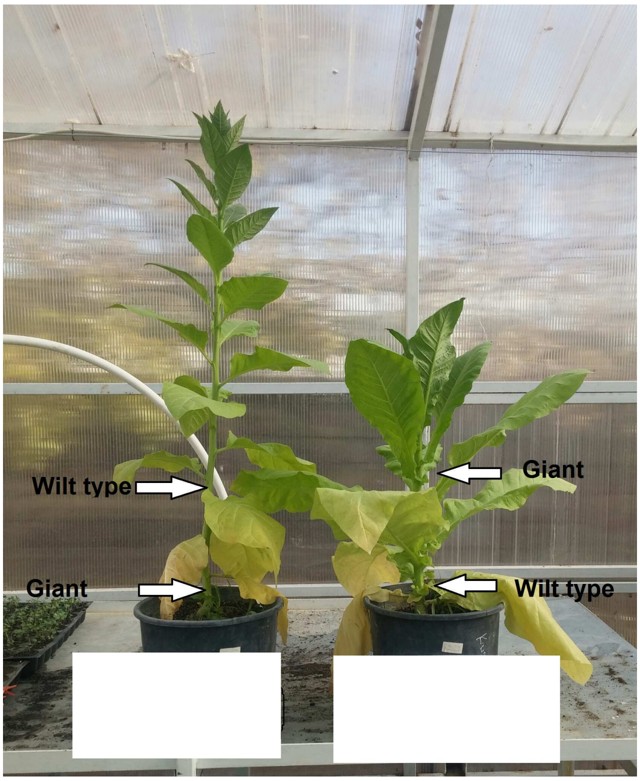

Figure 1. Reciprocal grafting at Nicotiana in this study.

4. CONCLUSIONS

A more detailed study is needed whether signal goes from rootstock to scion.

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