



STUDY EFFECTS OF SEVERAL SUCKER CONTROLLERS APPLICATION WITH DIFFERENT CONCENTRATION ON YIELD OF VIRGINIA TOBACCO (MALE STERILE CULTIVAR PVH19)

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ABSTRACT

For study effects of several sucker controller usage with different concentrations in increasing yield of Virginia tobacco (cultivar male sterility PVH19) in order to determination of the best controlling method for suckers in this plant an experiment in randomized complete block design with three replications in Bodian village (Rasht township) in 2011 farming year was conducted. The studied treatments in this research were consisting of 14 levels of different chemicals suckers' controller (fatty alcohol, prime plus) with different concentrations (15 and 20 cc) and different application times (10 and 14 days). Measured traits in this study were consisting of fresh leaf yield, leaf width, stem diameter and number of leaves per plant. Results of experiment showed that, the effect of applied treatments on traits of leaf width and stem diameter was significant at 1% probability level, also on fresh leaf yield at 5% probability level. But on number of leaves per plant was non significant. The highest yield of fresh leaf was recorded from topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 14 days (41730 kg/ha).

Keywords: tobacco, sucker controllers, yield, Iran.

INTRODUCTION

Yield, quality and usability of tobacco (*Nicotiana tabacum* L.) depend on three important factors: genetic potential of a cultivar, environmental conditions of production and cultural practice. All the experiments conducted so far indicate that each factor contributes to production efficiency and it is difficult to discern which is more important [1, 2]. The genetic potential of each tobacco cultivar contains possible theoretical limits to the realization of a particular characteristic. How much potential shall be realized depends on the effect of external factors, which also include the activities taken by tobacco growers through the growing measures [3]. Each agricultural operation affects tobacco yield and quality in the adequate way.

Topping can prevent the reproductive growth and enlarge the tobacco leaves, especially beneficial to the full maturity of leaves in the middle and upper positions, so as to improve the tobacco production and quality [4]. However, axillary buds will also start growing well to form branches while the tobacco plant is topped, and compete with leaves for nutrients and water, so many of the benefits of topping will be lost due to the growth of axillary buds [5, 6]. It is of important practical significance to form ideal production and quality by the timely control or removal of axillary buds after topping a tobacco. As is known to all, artificial wiping is a continuously time-consuming process, and in the operating process pathogens may go through the wound into tobacco plant resulting in diseases transmission. For over five decades, researchers home and abroad are studying the use of

chemical suckercide to control the growth of tobacco axillary buds [7].

Four types of chemicals are available for sucker control [8]:

- Contacts (fatty alcohols), which kill small suckers by touching and burning them.
- Contact-local systemics (Prime plus, flupro or butralin), which must touch the suckers to be effective, although they also retard sucker growth by inhibiting cell division.
- A systemic (maleic hydrazide [MH]), which moves from sprayed leaves to small sucker buds and retards their growth by inhibiting cell division.
- Mixtures of two of these chemical types.

Interlandi *et al.* (2002) with study limited effect of sucker control on yield of Italian style Burley tobacco were reported that, the application of prime plus showed a slight improvement of shoot control, but no effect on yield [9]. Reed (2008) was reported that, the fatty alcohol application a 4 percent solution or 2 gallons in 48 gallons of water had a positive and significant effect on tobacco suckers control [10].

The aim of current study is evaluation effects of several sucker controller application with different concentrations in yield and several attributes of Virginia tobacco (cultivar male sterility PVH19) in order to determine the best controlling method for suckers in this plant.



MATERIALS AND METHODS

In order to study the effects of several sucker controller usage with different concentrations in increasing yield of Virginia tobacco (cultivar male sterility PVH19) for determination of the best controlling method for suckers in this plant, an experiment in randomized complete block design with three replications in Bodian village (Rasht township, 37°16' N, 49°31' E, altitude: -5 m) in 2011 farming year was conducted. The location of experiment is shown in (Figure-1). The studied treatments in this research were consisting of 14 levels (T_1 - control without topping and solution spraying, T_2 - control with topping and without solution spraying, T_3 - topping on button stage and two times spraying with fatty alcohol 3% (15 cc for each plant) with time interval of 10 days, T_4 - topping on button stage and two times spraying with fatty alcohol 3% (15 cc for each plant) with time interval of 14 days, T_5 - topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 10 days, T_6 - topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 14 days, T_7 - topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (15 cc for each plant), T_8 - topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 14 days spraying

with prime plus 125 EC (15 cc for each plant), T_9 - topping on button stage and two times spraying with fatty alcohol 3% (20 cc for each plant) with time interval of 10 days, T_{10} - topping on button stage and two times spraying with fatty alcohol 3% (20 cc for each plant) with time interval of 14 days, T_{11} - topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 10 days, T_{12} - topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 14 days, T_{13} - topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (20 cc for each plant), T_{14} - topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 14 days spraying with prime plus 125 EC (20 cc for each plant)). All chemical suckers' controllers spraying on plants were applied after topping operations (Figures 2 and 3). Measured traits in this study were consisting of fresh leaf yield, leaf width, stem diameter and number of leaves per plant. Soil analysis results show that (Table-1), the soil texture was loam and pH, 6.94. Climatic data of the studied period were showed in (Table-2). The data was analyzed using SAS software. The Duncan's multiple range tests (DMRT) was used to compare the means at 5% of significant.

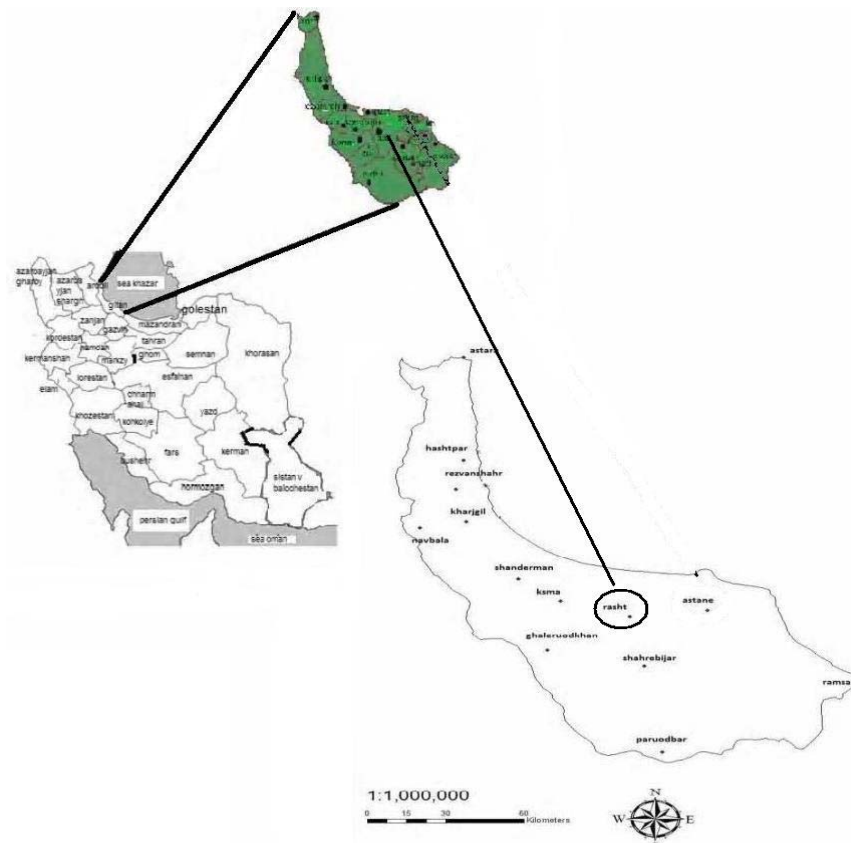


Figure-1. The geographical location of study area.



Figure-2. The topping operations.



Figure-3. The spraying of chemical sucker controllers on plants.

Table-1. Soil physical and chemical analysis.

| | | | |
|--------------|------|--------------------------|--------|
| Sand (%) | 40.5 | Organic carbon (%) | 0.858 |
| Silt (%) | 36 | Phosphorus (mg/kg) | 90.97 |
| Clay (%) | 23.5 | Potassium (mg/kg) | 117.70 |
| Soil texture | loam | EC (ds m ⁻¹) | 0.446 |

**Table-2.** meteorological data during experiment.

| Month | Minimum temperature (°C) | Maximum temperature (°C) | Relative humidity (%) | Rainfall (mm) |
|-----------|--------------------------|--------------------------|-----------------------|---------------|
| March | 8 | 18.3 | 89 | 138.9 |
| April | 13.4 | 22.3 | 83 | 27.5 |
| May | 17.7 | 24.5 | 85 | 18.5 |
| June | 22.6 | 27.2 | 81 | 35.2 |
| July | 25.4 | 32.4 | 64 | 1.5 |
| August | 23.1 | 28.3 | 82 | 266.3 |
| September | 19.8 | 27.4 | 88 | 232 |

RESULTS AND DISCUSSIONS

Fresh leaf yield

According to variance analysis table (Table-3), the effect of sucker controller application showed significant differences at 5% probability level on fresh leaf yield of tobacco cultivar (P VH19). Comparison of mean between sucker controller application levels showed that (Table-4), the highest yield of fresh leaf was recorded from topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 14 days (41730 kg/ha). On the other hand, the treatments of topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 14 days spraying with prime plus 125 EC (15 cc for each plant), topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (20 cc for each plant), topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 10 days, topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (15 cc for each plant), topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 14 days and topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 10 days statistically were placed in same level with treatment of topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 14 days. Also, the lowest amount of fresh leaf yield was recorded from treatment of control with topping and without solution spraying (27070 kg/ha). Similar results were reported by Stojanova *et al.*, 1986; Bangarayya *et al.*, 1988; Moore, 1996; Williams, 2007; Sykes, 2008.

Leaf width

With attention to variance analysis results (Table-3), the effect of sucker controller application on trait of leaf width had significant differences at 1% probability level. Comparison of mean between sucker controller application levels showed that (Table-4), the

highest amount of leaf width was recorded from topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (20 cc for each plant) treatment (32.93 cm). Also, the treatments of topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (15 cc for each plant), topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 14 days spraying with prime plus 125 EC (15 cc for each plant) and topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 14 days statistically were placed in same level with treatment of topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 10 days spraying with prime plus 125 EC (20 cc for each plant). On the other hand, the lowest amount of leaf width was recorded from treatment of control with topping and without solution spraying (28.17 cm). Increasing leaves size after topping and spraying of chemical sucker controllers observed in (Figure-4). Similar results were obtained by Moore, 1996; Williams, 2007; Sykes, 2008; Reed, 2008; Munthali and Magulu, 2011.

Stem diameter

Variance analysis table showed that (Table-3), the effect of sucker controller application on trait of stem diameter was significant at 1% probability level. With regards to comparison of mean between sucker controller application levels (Table-4), the highest amount of stem diameter was recorded from topping on button stage and spraying with fatty alcohol 3% (20 cc for each plant) then with time interval of 14 days spraying with prime plus 125 EC (20 cc for each plant) treatment (33.09 mm). On the other hand, the lowest amount of this trait was obtained from control with topping and without solution spraying treatment (28.11 mm). Similar results were recorded from Palmer, 1999; Stojanova *et al.*, 1986; Bangarayya *et al.*, 1988; Moore, 1996; Williams, 2007.

**Table-3.** Variance analysis of studied traits.

| Source of variance | df | Fresh leaf yield | Leaf width | Stem diameter | Number of leaves per plant |
|--------------------|----|----------------------------|---------------------|---------------------|----------------------------|
| | | Ms | | | |
| Block | 2 | 22619010.024 ^{ns} | 3.685 ^{ns} | 2.859 ^{ns} | 1.959 ^{ns} |
| Treatment | 13 | 54816955.883 [*] | 4.624 ^{**} | 4.052 ^{**} | 0.835 ^{ns} |
| Error | 26 | 24644079.844 | 1.139 | 1.305 | 1.035 |
| Cv% | | 13.48 | 3.36 | 3.67 | 3.89 |

Ns, ** and * respectively: non significant, significant in 1% and 5% area

Table-4. Comparison of mean effect of studied treatments on measured traits.

| Treatments | Fresh leaf yield | Leaf width | Stem diameter | Number of leaves per plant |
|------------|------------------|------------|---------------|----------------------------|
| T1 | 28890 bc | 30.40 b | 30.84 b | 25.40 a |
| T2 | 27070 c | 28.17 c | 28.11 c | 25.30 a |
| T3 | 35610 abc | 31.70 ab | 30.36 b | 26.47 a |
| T4 | 37830 ab | 32.33 ab | 31.89 ab | 26.63 a |
| T5 | 39410 a | 32.17 ab | 30.84 b | 26.57 a |
| T6 | 41730 a | 32.37 ab | 30.27 b | 26.50 a |
| T7 | 39410 a | 32.80 a | 31.30 ab | 26.83 a |
| T8 | 40960 a | 32.63 a | 31.44 ab | 26.37 a |
| T9 | 34120 abc | 32.37 ab | 31.81 ab | 25.97 a |
| T10 | 36230 abc | 31.40 ab | 31.22 ab | 25.80 a |
| T11 | 38650 a | 31.50 ab | 32.28 ab | 25.23 a |
| T12 | 38760 a | 32.50 a | 30.87 b | 26.07 a |
| T13 | 39560 a | 32.93 a | 31.87 ab | 26.57 a |
| T14 | 37150 ab | 32.10 ab | 33.09 a | 26 a |

Within each column, means followed by the same letter do not differ significantly at $P < 0.05$

Number of leaves per plant

With regard to variance analysis table (Table-3), the effect of sucker controller application on number of leaves per plant was non significant. Nonetheless, among same levels, the highest number of leaves per plant was recorded from topping on button stage and spraying with fatty alcohol 3% (15 cc for each plant) then with time interval of 10 days spraying with prime

plus 125 EC (15 cc for each plant) treatment (26.83 leaves) and the lowest amount of this trait (25.23 leaves) was recorded from topping on button stage and two times spraying with prime plus (20 cc for each plant) with time interval of 10 days (Table-4). Similar results were obtained by Moore, 1996; Williams, 2007; Sykes, 2008; Reed, 2008; Munthali and Magulu, 2011.



Figure-4. Increasing leaves size after topping and spraying of chemical sucker controllers.

CONCLUSIONS

With attention to obtained results of current study, the application of chemicals sucker controllers after topping process had a positive effect on measured traits and increased the fresh yield of Virginia tobacco (cultivar male sterility PVH19). According to this findings, the best suckers controlling method for obtained to highest fresh leaf yield was the treatment of topping on button stage and two times spraying with prime plus 125 EC (15 cc for each plant) with time interval of 14 days.

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