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Effect of 1-Methylcyclopropene on Scabiosa Caucasica

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Abstract--To find the effect of 1-Methylcyclopropene on scabiosa caucasica. Method- Similar quantity doses of methylcycopropene were sprayed on different plants on different time and frequency of same concentration. Results were compared to untreated plant. Findings- scabiosa caucasica is sensitive to Methylcyclopropene. Certain amount of MCP aids quality of plant. Applications- methylcycopropene can be used on scabiosa caucasica to extent it's post harvest life.
Keywords- Methylcyclopropene , yield, plant height, petal per flower, flower diameter, average life of flower

I. INTRODUCTION

1-Methylcyclopropene (MCP) belongs to a class of compounds called cyclopropenes. MCP has a structure, which is closely related to natural plant hormone- ethylene. It is commercially used to regulate ripening of fruits and vegetables and maintain the freshness of cut flowers. 1-MCP is comparatively new product for edible horticultural crops, and registration for its commercial use is still ongoing in several countries. MCP has received a good response in market due to its economical utility of preserving fruits and vegetables, leading to wide spread usage worldwide. MCP can increase storage time of apples upto 300% to 400% (J.R. Schupp, et al. 2008) allowing farmers to sell their produce in offseason yielding higher profits. For the past few years, the commercial form of 1-MCP has been used on postharvest on apples and other edible horticultural crops. Many different reviews on the effects of 1-MCP have been published (Blankenship and Dole 2003, Serek et al. 2006, Watkins 2006,2007, Huber 2008, Watkins 2008a, 2008b, 2010). Commercial use of 1-MCP-based technologies for apple was launched in 2002 in Chile and Argentina and 2003 in New Zealand, South Africa, and the United States. Nevertheless, issues that identify strengths and weaknesses of the technology continue to be under investigation. More results on commercialization are likely to be available in the future. 1-MCP simulates the growth hormone of plant: Ethylene. The responsiveness or 1-MCP depends on:

The crop,

The stage of plant development,

The temperature,

The concentration of ethylene,

The duration of exposure

Ethylene is a hydrocarbon which has the formula C_2H_4 or $H_2C=CH_2$. It is a colorless flammable gas with a faint "sweet and musky" odor when pure. Ethylene has its own benefits and its own losses. It is used in a positive manner in fruit ripening. It can also cause damage on crops such as yellowing of vegetables, or abscission in ornamentals (leaves, flowers drop off). Factors deciding importance of Ethylene are:

If a crop naturally produces a lot of ethylene, and

If it is responsive to ethylene.

The experiments are conducted on scabiosa caucasica (pincushion flower). Scabiosa caucasica is a species of flowering plant in the family Caprifoliaceae, native to the Caucasus, north eastern Turkey, and northern Iran. Growing to 60 cm (24 in) tall and broad, it is a clump-forming perennial with divided leaves. Pincushion-shaped buds, borne on erect stems, open to pale blue or lavender flower heads, 8 cm (3 in) in diameter, bloom from May to July in ideal temperature 18° to 24°

II. METHOD

These experiments were conducted in 2016. Sample of similar scabiosa caucasica (pincushion flower) was planted in 4 rows and 5 columns on Feb 15, 2016. A proprietary formulation of 1-MCP intended for application by spraying (spray-able 1-MCP) was used in the trials, supplemented with 1.0% v/v low- viscosity spray oil. All applications were made with a hydraulic handgun sprayer. The experiment was arranged in a randomized complete block design with four replications. Treatments consisted of: (Treatment 1)

Untreated control; (Treatment 2) 1-MCP at 10 μg/m^2 applied at first flower (FF), (Treatment 3) 1-MCP at 10 μg/m^2 applied at FF and at FF+2 weeks, (Treatment 4) 1-MCP at 10 μg/m^2 applied at FF, FF+1, FF+2, FF+3 weeks.

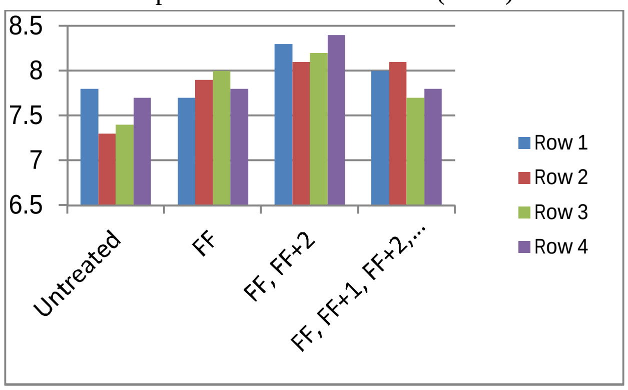
After 7 weeks (April 1, 2016) sample was collected and results were noted.

III. RESULTS

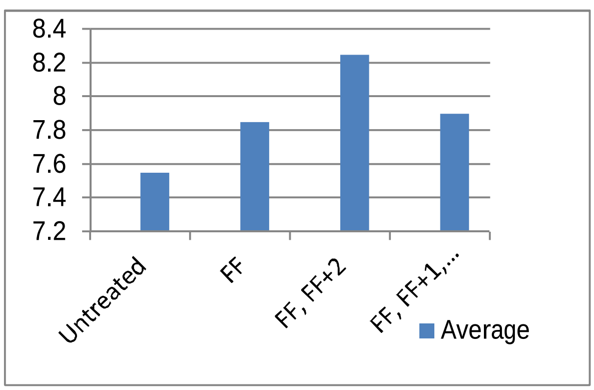
A. Diameter of Flower

In the evaluation of sample collected. Flower diameter was consistent to previous assumptions and extrapolations. There was a significant increase in diameter of the flower due to 1-MCP but excess 1-MCP could hamper quality and the size of the diameter. Treatment 3 (FF, FF+2) had the largest average diameter and produced the largest individual flower. Largest individual flower was 11.258% larger than average untreated flower. The average diameter of treatment 3 plants was 9.217% more than average untreated plant. Whereas on average treatment 2 and 4 yielded 3.973% increase and 4.635% increase respectively.

Graph 1 – Size of all Flowers (in cm)



Graph 2 - Average Flower size (in cm)



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Rounded off to nearest millimeter

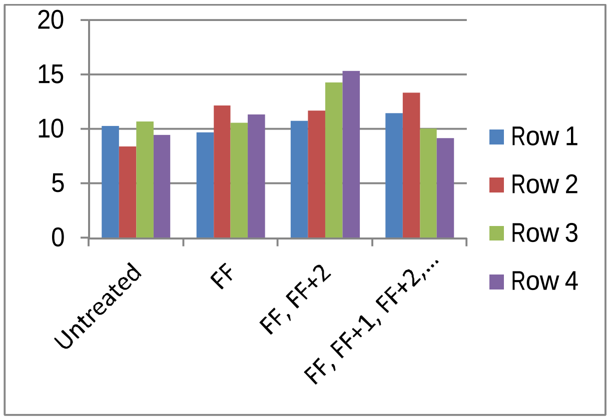
Table 1 – Values of all flowers according to their treatment and rows

	Row 1	Row 2	Row 3	Row 4	Average
Untreated	7.8	7.3	7.4	7.7	7.55
FF	7.7	7.9	8	7.8	7.85
FF, FF+2	8.3	8.1	8.2	8.4	8.25
FF, FF+1, FF+2, FF+3	8	8.1	7.7	7.8	7.9

B. Petals Per Flower

Furthermore, In the evaluation of sample collected, number of petals was consistent expected outcome. There was a significant increase in number of petal in the flower due to 1-MCP but excess 1-MCP could hamper quantity of the petals. Treatment 3 (FF, FF+2) had the highest average number of petals and produced the highest number of petals in flower. Highest number of petals in flower was 49 % more than average petals of untreated flower. The average number of petals of treatment 3 plants was 38.817% more than average untreated plant. Whereas on average treatment 2 and 4 yielded 12.853% increase and 18.251% increase respectively.

Graph 3 – Number of average petals of each row



Graph 4 – Average number of petals according to treatment

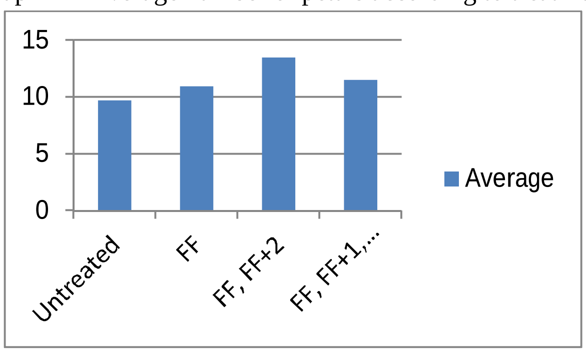


Table 2 – Average of number of petals of all flowers according to their treatment and rows

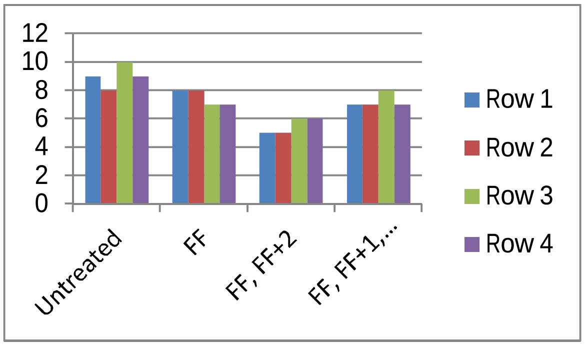
	Row 1	Row 2	Row 3	Row 4	Average
Untreated	9	8	10	9	9
FF	8	8	7	7	7.5
FF, FF+2	5	5	6	6	6.5
FF, FF+1, FF+2, FF+3	7	7	8	7	7.25

C. Yeild

Analysis of Number of flower yielded that number of flowers are inversely proportional to the quantity of 1-MCP applied to the plant except at the high concentration of 1-MCP. Although there is a decline in the number of flowers in the plant but the quality (diameter and number of petals) has improved drastically.

On contrary treatment 3 had the lowest average number of flowers and produced the lowest number of flowers. Treatment 1 (untreated) produced the highest number of flowers. Highest number of flowers was 38.461 % more than average number of flowers of treatment 3 flowers (lowest). The average number of flowers of treatment 3 plants was 27.77% less than average untreated plant. Whereas on average treatment 1 and 4 yielded 16.66% decrease and 19.44% decrease respectively.

Graph 5 – Number of flowers in each row



Graph 6 – Average number of flowers according to treatment

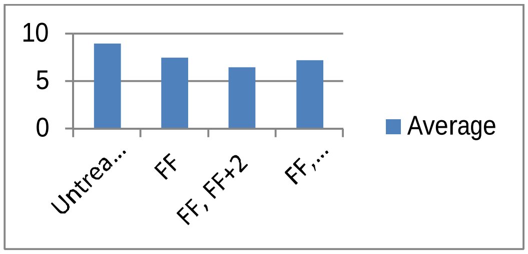


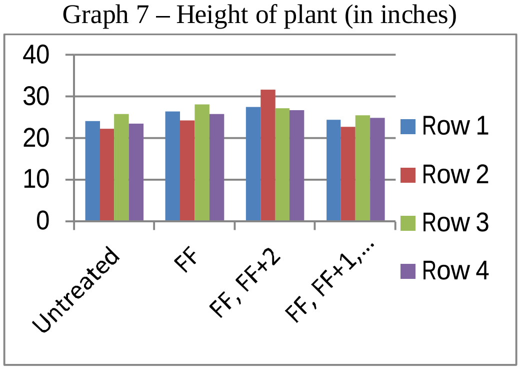
Table 3 – Average of number of flowers according to their treatment and rows

	Row 1	Row 2	Row 3	Row 4	Average
Untreated	10.3	8.4	10.7	9.5	9.725
FF	9.7	12.2	10.6	11.4	10.975
FF, FF+2	10.8	11.7	14.3	15.4	13.5
FF, FF+1, FF+2, FF+3	11.5	13.4	10.1	9.2	11.5

D. Height

Moreover, the analysis of data led to confirmation of previous assumptions and extrapolations. There was a noteworthy increase in height of the plant due to 1-MCP but excess 1-MCP could hamper quantity of the plant and its growth. Treatment 1 (untreated) had the least average height, whereas treatment 3 had the most efficient growth spurt. Treatment 3 had grown 18.371 % more than height of untreated plant. Whereas on average treatment 2 and 4 yielded 9.498% increase and 2.087% increase respectively.

Graph 7 – Height of plant (in inches)



*rounded off to nearest tenths decimal

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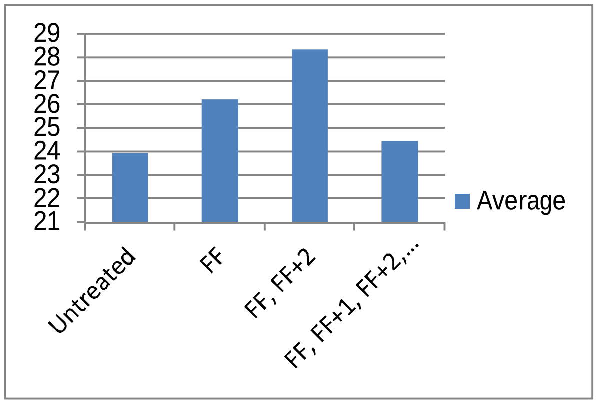
Graph 8 – Average height according to treatment



*rounded off to nearest tenths decimal

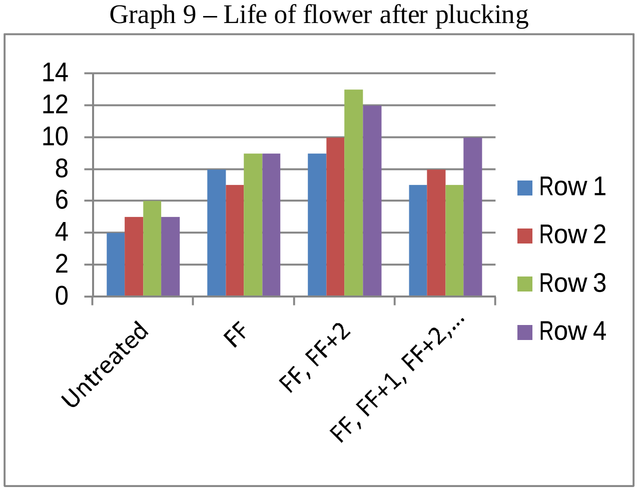
Table 4 – Height of plant according to their treatment and rows

	Row 1	Row 2	Row 3	Row 4	Average
Untreated	24.1	22.4	25.8	23.5	23.95
FF	26.5	24.4	28.2	25.8	26.225
FF, FF+2	27.5	31.8	27.3	26.8	28.35
FF, FF+1, FF+2, FF+3	24.5	22.8	25.5	24.9	24.45

E. Average Flower Life

Conforming to the pervious pattern again treatment 3 shows the most life span of preserving flower plucked from the plant kept in same conditions. On an average untreated flower could only last 5 days on the other hand flower which receive treatment 3 lasted 11 days on an average which is 83.33% more than untreated flower. Furthermore, flowers with treatment 2 and 4 lasted 70% more and 60% more respectively.

Graph 9 – Life of flower after plucking



Graph 10 –Average lifespan of plants

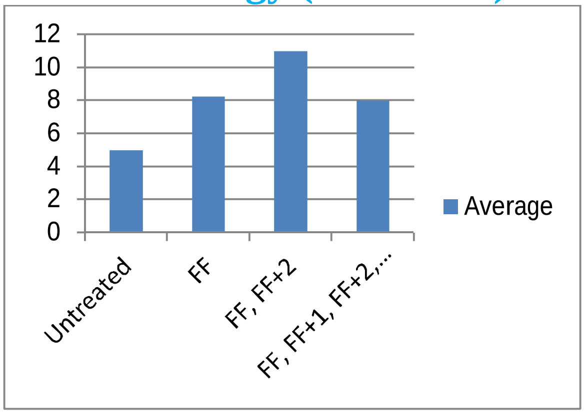


Table 5 – Average lifespan of flowers according to their treatment and rows

	Row 1	Row 2	Row 3	Row 4	Average
Untreated	4	5	6	5	5
FF	8	7	9	9	8.25
FF, FF+2	9	10	13	12	11
FF, FF+1, FF+2, FF+3	7	8	7	10	8

IV. CONCLUSIONS

The reactivity of scabiosa caucasica to 1-MCP proves that scabiosa caucasica is ethylene-producing plant and is dependent on ethylene for its growth and ripening. The above experiment gave us anticipated results with the plants and flowers. Treatment 1, 2, 3 and 4 received 0 μg/m^2, 10 μg/m^2 , 20 μg/m^2 , 40 μg/m^2 of 1-MCP respectively in intervals mentioned above.

Treatment 1 was the base experiment for comparison of reaction of scabiosa caucasica to different concentrations of 1-MCP. Treatment 1 gave the best results in yielding number of flowers bloomed. To yield more quantity of flowers treatment 1 is recommended.

Treatment 2 and 4 were yielding nearly equal and comparable results. The treatment 2 lacked proper amount of 1-MCP to aid the growth of the plant whereas treatment 4 had excessive amounts of 1-MCP. Abundance of 1-MCP can hamper the growth of the plant.

Treatment 3 gave the best results in every aspect diameter, number of petals, plant height and average life of flower except number of flowers. This happens because of limited nutrition and resources in the soil and environment available to plant. But Treatment 3 yielded the better quality flowers and due to more petals, consequently, had more yield. Treatment 3 is recommended for normal usage in horticulture.

No abnormal symptoms were seen even on overdose of 1-MCP. This observation can be extrapolated to infer that even high doses of 1-MCP are not lethal to plants.

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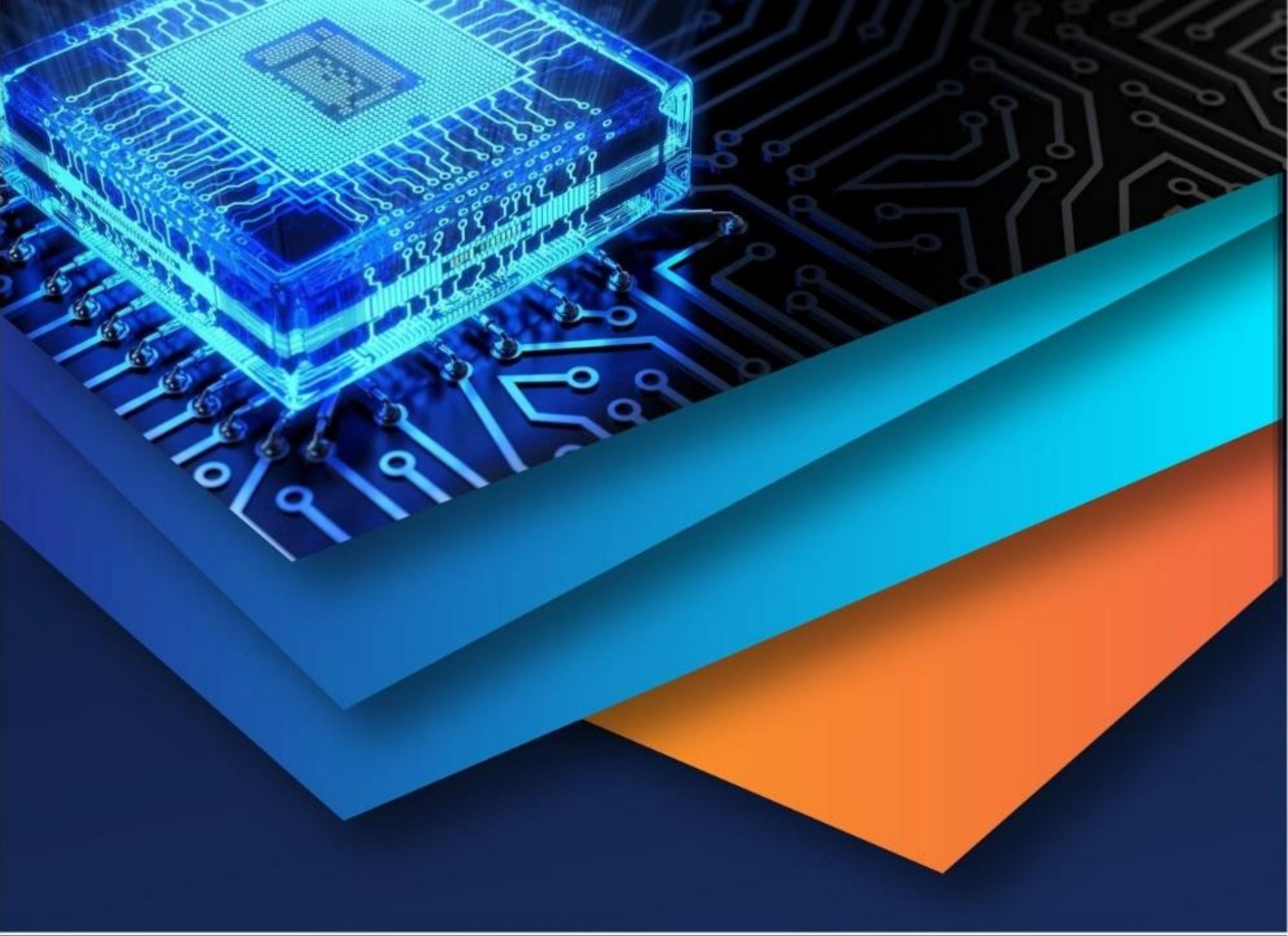

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