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Flower enhancement in saffron under controlled conditions using plant growth regulators

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Abstract

Saffron (*Crocus sativus* L.) is both economically and medicinally an important flowering plant, cormous perennial crop, which reproduces vegetatively. With the advance in new applications of pharmacology, demand of the stigmata is increasing, for this reason the studies on enhancement of flowers is gaining importance. An investigation was undertaken to find out the effect of plant growth regulators on enhancement of flowering in saffron under green house in 2017-18 at ICAR-CITH Srinagar. Among the various treatments of growth regulators along with different media used Colchicines (0.5%)+GA3(150ppm)+NAA(150ppm)+CCC (500ppm)] and [Cocopeat +Vermiculite +Soil (1:1:1), Colchicines (0.5%)+GA3 (100ppm) +NAA(200ppm)+CCC (500ppm)] showed maximum number of flowers. Hence growth regulators can be used for enhancing the flowering in saffron which finally enhances the economic part for better returns and economic benefits under controlled conditions.

Keywords: Saffron, growth regulators, media, flower, enhancement

Introduction

Saffron (*Crocus sativus* L.) is an important autumn medicinal flowering plant, cormous perennial, a sterile triploid, reproduces vegetatively, a golden condiment which belongs to family Iridaceae (Renau M *et al.*, 2013) ^[1]. In India, state Jammu and Kashmir is having monopoly in this crop. In the state of Jammu and Kashmir, 5361 hectares of area is under cultivation of this crop with a production of 173.82 quintals worth 43 crores annually. The average productivity in Jammu and Kashmir State is reported to be declining year after year (Bushra 2018) ^[2]. Several factors have been identified to be the cause of decline in productivity. Less rainfall or drought like situations during active period of corm multiplication or at the time of flowering, inadequate soil nutrients and above all the incidence of many biotic factors like pests and corm rot disease are the major constraints in harvesting the maximum flower yields (Mushtaq A 2011) ^[3]. Saffron stigmata development and biosynthesis of apocarotenoids during different stages of stigma development are essential components for medicinal and aromatic purposes (Mir J.I *et al* 2015) ^[9]. Demand of the stigmata is increasing as new applications in pharmacology emerge (Aysun C 2017) ^[4]. For this reason the studies on enhancement of flowers is gaining importance. Therefore for this purpose some of the studies (Khan *et al.*, 2011, Cavusoglu and Sulusoglu 2012) ^[5, 6] have focused on effect of natural and chemical fertilization by applying to the soil in saffron. However, the yield and quality production of flower is low which needs to be increased by adopting improved horticultural techniques. Plant growth regulators have significant role in modifying the growth and flowering of plants (Sable P B 2015) ^[7]. An investigation was undertaken to find out the effect of plant growth regulators on enhancement of flowering in saffron.

The greenhouse trial was conducted in 2017-18 at ICAR-CITH Srinagar station. Saffron corms of size 15-30 mm in diameter, varied between 3-6g were provided from non-treated growing areas. Before planting corms were treated with Bavistin@2gm/L of water followed by mixture of GA3 (400PPM) + NAA (400PPM) + CCC (1000PPM). Planting of saffron corms was done in seven different media, which were given seven different treatments respectively as shown in table1. Corms were placed 10x10 cm distance between and within rows in 5 cm depth in to the soil on 15th of September 2017. Experiment was conducted in a randomised block design with three replication.

Plant growth regulators used were dissolved first in requisite solvents then after in distilled water for use (Aysun C 2017) [4]. The solution of growth regulators was applied directly to the media at once 5 days after corm planting, when initially plant growth observed. The treated plots were regularly irrigated with tap water in the same amount weekly. Flower data from each treatment was taken and statistically analysed using OPSTAT software available on website <http://hau.ernet.in/about/opstat.php> (Sheoran, OP 1998).

The flower data shown in table 1, revealed that, from each treatment T1 [Cocopeat +Soil(1:1), Colchicines(0.5%)+GA3(150ppm)+NAA(150ppm)+CCC (500ppm)] and T6 [Cocopeat+ Vermiculite +Soil(1:1:1), Colchicines (0.5%)+GA3 (100ppm) +NAA(200ppm)+CCC (500ppm)] were having maximum number of flowers (Figure 1), while as the T7 where soil and water (Control) was used were having least number of flowers. Statistical analysis also showed that there is significant difference between the treatments; T1 and T6 were statistically at par. The flowering in different treatments is shown in Figure 1. The data revealed

that the treatments having colchicines shows maximum number of flowers, hence provides clue that there is some direct role of colchicines for enhancement of flowering in saffron. The role of plant growth regulators for flower enhancement has already been studied in other flower crops like gladiolus, where flower quality parameters, maximum number of florets/ spike, floret length, length of spike were recorded highest with foliar spray of GA3 200 ppm and CCC 750 ppm (Sable P.B 2015) [7]. In conclusion the growth regulators when applied exogenously to saffron can enhance the flowering when used in proper concentration and combination, which was also confirmed from our study. Hence the treatments Colchicines(0.5%)+GA3(150ppm)+NAA(150ppm)+CCC (500ppm)] and T6 [Cocopeat +Vermiculite +Soil(1:1:1), Colchicines(0.5%)+GA3 (100ppm) +NAA(200ppm)+CCC (500ppm)] can be used for enhancing the flowering in saffron for better returns and economic benefits under controlled conditions.

Table 1: Details of different treatments (Media+ Growth regulators) along with their concentrations and effect on flower enhancement in saffron

Treatments	Media	Plant Growth Regulators	Average Number of Flowers
T1	Cocopeat +Soil(1:1)	Colchicines(0.5%)+GA3(150ppm)+NAA (150ppm)+CCC (500ppm)	20.33
T2	Cocopeat+Soil (3:1)	GA3(150ppm)+ NAA(150ppm)+CCC (200ppm)	9.33
T3	Vermiculite+Soil(1:1)	GA3(100ppm)+ NAA(150ppm)+CCC (500ppm)	8.66
T4	Vermiculite+soil (3:1)	GA3(150ppm)+ NAA(150ppm)+CCC (400ppm)	11.66
T5	Cocopeat+Vermiculite (1:1)	GA3(50ppm)+ NAA(50ppm)+CCC (50ppm)	7.33
T6	Cocopeat+Vermiculite+Soil(1:1:1)	Colchicines(0.5%)+GA3(100ppm)+NAA(200ppm)+CCC (500ppm)	20.66
T7	Soil (Control)	Dist. water	4.6
C.D		2.20	
SE(m)		0.70	
SE(d)		1	
C.V.		10.37	

GA3-Gibberlic acid, CCC-Cycocel, NAA-Napthalene acetic acid



Fig 1: The maximum number of flowers a) T1 [Cocopeat +Soil(1:1), Colchicines (0.5%) + GA3(150ppm) + NAA(150ppm) +CCC (500ppm)] b) T6 [Cocopeat + Vermiculite +Soil (1:1:1), Colchicines(0.5%)+GA3 (100ppm) +NAA(200ppm)+CCC (500ppm)]

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