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ADJUSTING THE BEST N, P AND K FERTILIZERS REQUIRED FOR MAXIMIZING GROWTH AND FLOWERING OF JASMINUM SAMBAC PLANTS

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ABSTRACT

This study was conducted during ٢٠٠٨ and ٢٠٠٩ seasons to examine the effect of different levels of N, P and K fertilization on growth and flowering aspects as well as nutritional status of *Jasminum sambac* plants. Selecting the best N, P and K levels is considered as another target.

Results showed that fertilization with N at ٢٠ – ٣٠ g as well as P and K each at ٥ – ٢٠ g per plant considerably stimulated all growth characters namely plant height, number of leaves/ plant, leaf area and total surface area/ plant as well as flowering aspects such as number of flowers per plant and fresh weight of flowers per plant, as well as contents of plant nutrients (N, P and K) and content of plant pigments (chlorophyll a & b, total chlorophylls and carotenoids) in relative to the check treatment. Average fresh weight of flowers tended to reduce with NPK treatments comparing with unfertilization. Increasing levels of N from ٢٠ to ٣٠ g/ plant was followed by enhancing all growth traits, average fresh weight of flowers and N % and reducing flowering aspects (number of flowers/ plant and weight of fresh flowers/ plant), P %, K % and plant pigments. A remarkable promotion on all growth characters, number of flowers/ plant, fresh weight of flowers/ plant, P %, K % and plant pigments was observed with increasing P and K levels from ٥ to ٢٠ g/ plant. Only both average fresh weight of flower and N % were gradually reduced with increasing both P and K rates.

For enhancing growth and flowering aspects of *Jasminum sambac* plants, it's advised to fertilize the plants with N, P and K at ٢٠ g per plant for each nutrient.

INTRODUCTION

Jasminum sambac, Ait belonging to family Oleaceae is one of the most desirable and showy small evergreen flowering shrubs in Egypt. It is widely grown in home gardens, in the landscape and extensively used as a pot plant in roof, terrace and balcony gardens. The large, double white flowers with too nice smelling in Spring, Summer and Fall are very attractive for the use as cut flowers. Most important, the extractable crude oil is very expensive as is extensively demanded by foreign markets for preparing high quality perfume and cosmetics.

Nutrients especially N, P and K have many important functions for all plants. They have responsible for enhancing organic foods biosynthesis, enzymes, cell division and water uptake (Nijjar, ١٩٨٥).

Fertilization with N, P and K is essential for inducing higher growth and flowering in various ornamental plants. Adjusting the optimum rates from these nutrients leads to shorten the vegetative growth stage and accelerate flowering aspects.

Previous studies revealed that balancing N, P and K fertilization in horticultural crops especially ornamental plants was followed by enhancing growth and flowering aspects (Qasim *et al*., ٢٠٠٣; El-Mohndes *et al*., ٢٠٠٥; Al- Thabet, ٢٠٠٦; Abdou *et al*., ٢٠٠٦, Rao *et al*., ٢٠٠٧; El- Sanafawy, ٢٠٠٧; Khalil *et al*., ٢٠٠٨; Awad and Ghrib, ٢٠٠٩; Abd El- Zaher *et al*., ٢٠٠٩; Babaiy *et al*., ٢٠٠٩; Ardelan *et al*., ٢٠١٠ and Abdou *et al*., ٢٠١١).

The merit of this study was adjusting the best levels of N, P and K fertilization for maximizing growth and biomass of *Jasminum sambac* plants.

MATERIALS AND METHODS

This study was conducted at the experimental farm of King Abdulaziz Univ. at Hada Al- Sham that located about ١٢٠ km northeast of Jaddah, Saudi Arabia during ٢٠٠٨ and ٢٠٠٩ seasons on one year old *Jasminum sambac* plants with one pranch. The plants

were pruned to equal height (٢٠ cm length) and planted on sandy soil (٠.٠٩ % N, ٥ ppm P and ١٠٠ ppm K) with ٩٠ × ٩٠ cm between plants and rows. Seedlings were planted on the first week of March during both seasons. The management practices like irrigation and weeding were the same for all treatments during entire period of study.

The present experiment included the following seven treatments of different levels of N, P and K:-

١- Unfertilization with N, P and K.
٢- Fertilization with ٢٠ g N + ٥ g P + ٥ g K/ plant.
٣- Fertilization with ٢٠ g N + ١٠ g P + ١٠ g K/ plant.
٤- Fertilization with ٢٠ g N + ٢٠ g P + ٢٠ g K/ plant.
٥- Fertilization with ٣٠ g N + ٥ g P + ٥ g K/ plant.
٦- Fertilization with ٣٠ g N + ١٠ g P + ١٠ g K/ plant.
٧- Fertilization with ٣٠ g N + ٢٠ g P + ٢٠ g K/ plant.

Each treatment was replicated three times, ten plants per each (as a plot) complete randomized block design was adopted. Ammonium sulphate (٢٠.٦ % N), calcium mono superphosphate (١٥.٥ % $P_٢O_٥$) and potassium sulphate (٤٨ % $K_٢O$) were the sources of N, P and K, respectively. They were divided into three equal batches and added at ٣٠, ٤٥ and ٦٠ days after planting.

Plants were allowed to grow and the following data on different growth and biomass indices of Jasminum were collected for three months (١st week of June) by adopting standard procedures.

١. Plant height (cm.).
٢. Number of leaves per plant.
٣. Leaf area ($cm^٢$) by using planimeter.
٤. Total surface area/ plant ($m^٢$).
٥. Number of flowers per plant.
٦. Fresh weight of flowers per plant.
٧. Average fresh weight of single flower (g.)
٨. Percentages of N, P & K in the leaves (according to Wilde *et al.*, ١٩٨٥).
٩. The contents of plant pigments namely chlorophylls a & b, carotenoids and total chlorophylls a & b (as mg/ ١.٠ g F.W) were determined in the fresh leaves according to Moran (١٩٨٢).

All the obtained data were analyzed statically and means were compared using new L.S.D at ٥ % (Mead *et al*., ١٩٩٣).

RESULTS AND DISCUSSION

١- Growth characters:

It is clear from the data in Table (١) that application of N at ٢٠ to ٣٠ and both P and K each at ٥ to ٢٠ g/ plant significantly stimulated the four growth aspects namely plant height, number of leaves per plant, leaf area and total surface area per plant comparing to unfertilization. The promotion on such growth characters was in proportional to the increase in the levels of N from ٢٠ to ٣٠ g and both P and K from ٥ to ٢٠ g/ plant. However, the differences between the higher two levels of N (٢٠ and ٣٠ g/ plant) on such growth traits did not assured significantly. Varying both P and K levels had significant effect on these growth parameters. The maximum values were recorded on the plants that fertilized with ٣٠ g N + ٢٠ g P + ٢٠ g K per plant. Unfertilization gave the lowest values. These results were true during both seasons.

The promoting effect of NPK fertilizers on growth characters was mainly attributed to their positive action on enhancing cell division and the biosynthesis of all organic foods (Nijjar, ١٩٨٥). These results are in approval with those obtained by Khalil *et al*., (٢٠٠٨); Awad and Ghrib (٢٠٠٩) and Abdou *et al*., (٢٠١١).

٢- Flowering aspects:

Both number of flowers per plant and fresh weight of flowers per plant were significantly improved with using N at ٢٠ to ٣٠ g and both P and K at ٥ to ٢٠ g per plant in relative to unfertilization. Increasing N levels from ٢٠ to ٣٠ g/ plant significantly reduced wight of single flower. Average fresh weight of flowers was significantly reduced with fertilization treatments in relative to unfertilization. The reduction on average fresh weight of flower was significantly associated with increasing N, P and K levels. Increasing both P and K levels significantly was responsible for increasing number of flowers per plant and fresh weight of flowers per plant. Supplying the plants with ٢٠ g N + ٢٠ g P + ٢٠ g K per plant gave the best results with regard to

flowering aspects. Unfavourable effects were detected on unfertilized plant. These results were obtained during both seasons.

Table ١: Effect of different levels of N, P and K fertilization on growth and flowering aspects of *Jasminum sambac* plants during ٢٠٠٨ and ٢٠٠٩ seasons.

N : P : K treatments	Plant height (cm.)		Number of leaves/ plant		Leaf Area (cm^2)		Total surface area/ plant (m^2)		Number of flowers per plant		Total fresh Weight of flowers per plant (g.)		Average Fresh weight of flower (g.)	
	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩
Unfertilization	٤٠.٠	٤٠.٩	٣٥.٠	٣٦.٣	٢٠.٠	٢١.٨	٠.٠٧	٠.٠٨	١٩.٠	٢٠.٠	٨.٩	٩.٠	٠.٤٧	٠.٤٥
٢٠ g N + ٥ g P + ٥ g K/ plant	٥٠.٠	٥١.٠	٤١.٠	٤٢.٣	٢٢.٣	٢٣.٩	٠.٠٩	٠.١٠	٢٧.٠	٢٨.٥	١٠.٦	١٠.٧	٠.٣٩	٠.٣٧
٢٠ g N + ١٠ g P + ١٠ g K/ plant	٥٤.٠	٥٥.٠	٤٧.٠	٤٨.٣	٢٥.٣	٢٧.٠	٠.١٢	٠.١٣	٣٧.٠	٣٨.٩	١١.٩	١٢.٠	٠.٣٢	٠.٣١
٢٠ g N + ٢٠ g P + ٢٠ g K/ plant	٥٨.٠	٥٩.٣	٥٣.٠	٥٤.٤	٢٨.٠	٢٩.٨	٠.١٥	٠.١٦	٥١.٠	٥٣.٠	١٢.٩	١٣.٠	٠.٢٥	٠.٢٥
٣٠ g N + ٥ g P + ٥ g K/ plant	٥٠.٥	٥١.٣	٤١.٨	٤٢.٨	٢٢.٦	٢٤.٠	٠.٠٩	٠.١٠	٢٣.٠	٢٤.٠	٩.٥	٩.٧	٠.٤١	٠.٤٠
٣٠ g N + ١٠ g P + ١٠ g K/ plant	٥٤.٥	٥٥.٦	٤٧.٦	٤٩.٠	٢٥.٥	٢٧.٣	٠.١٢	٠.١٣	٢٧.٠	٢٨.٠	١٠.١	١٠.٢	٠.٣٧	٠.٣٦
٣٠ g N + ٢٠ g P + ٢٠ g K/ plant	٥٨.٦	٦٠.٠	٥٣.٦	٥٥.٠	٢٨.٢	٣٠.٠	٠.١٥	٠.١٧	٤١.٠	٤٤.٠	١٠.٩	١١.٠	٠.٢٧	٠.٢٥
New L.S.D at ٥ %	٢.٩	٣.٠	٤.٠	٤.٠	١.٥	١.٥	٠.٠٢	٠.٠٢	٣.٦	٣.٩	٠.٦	٠.٦	٠.٠٥	٠.٠٤

The reducing effect of N at higher levels on flowering aspects was mainly, attributed to the great depletion of carbohydrates in building new tissues that reflected on lowering C/ N ration in favour of reducing flowering aspects.

These results are in approval with those obtained by Khalil *et al*., (٢٠٠٨); Awad and Ghrib (٢٠٠٩) and Abdou *et al*., (٢٠١١).

٣- Leaf chemical composition:

Data in Table (٢) obviously reveal that fertilization with N, P and K significantly enhanced percentages of N, P and K as well as plant pigments namely chlorophylls a & b, total chlorophylls and carotenoids in relative to unfertilization. Increasing levels of N from ٢٠ to ٣٠/ plant was significantly accompanied with enhancing N % and at the same time reducing both P and K as well as the investigated plant pigments.

Increasing P & K levels from ٥ to ٢٠ g/ plant was significantly very effective in enhancing both P % and K % and plant pigments and at the same time was responsible for reducing N %. Fertilization of the plants with ٣٠ g N+ ٥ g P + ٥ g K/ plant maximized N % and the maximum values of P & K and plant pigments were observed due to following fertilization program including the application of ٢٠ g N + ٢٠ g P + ٢٠ g K per plant. The minimum values were observed in unfertilized plants. These results were true during both seasons. These results are in agreement with those obtained by Abd El- Zaher *et al*., (٢٠٠٩); Ardelan *et al*., (٢٠١٠) and Abdou *et al*., (٢٠١١).

Finally, supplying *Jasminum sambac* plants with ٢٠ g N + ٢٠ g P + ٢٠ g K per plant is recommended for promoting growth, flowering and nutritional status of the plants.

Adjusting the best N, P and K

Table ٢: Effect of different levels of N, P and K fertilization on chemical composition of the leaves of *Jasminum sambac* plants during ٢٠٠٨ and ٢٠٠٩ seasons.

N : P : K treatments	N %		P %		K %		Chlorophyll a (mg/ ١٠ g. F.W)		Chlorophyll b (mg/ ١٠ g. F.W)		Total chlorophylls a & b (mg/ ١٠ g. F.W)		Carotenoids content (mg/ ١٠ g. F.W)	
	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩	٢٠٠٨	٢٠٠٩
Unfertilization	١.٤١	١.٤٦	٠.١٥	٠.١٧	١.١١	١.١٨	٢.١١	٢.٠٥	٠.٩١	٠.٩٥	٣.٠٢	٣.٠٠	١.٠٠	١.٠٣
٢٠ g N + ٥ g P + ٥ g K/ plant	١.٧٢	١.٧٧	٠.٦٦	٠.٦٦	١.٥١	١.٥٨	٢.٣١	٢.٤١	١.١١	١.١٥	٣.٤٢	٣.٥٦	١.٢٥	١.٢٨
٢٠ g N + ١٠ g P + ١٠ g K/ plant	١.٦٦	١.٧١	٠.٧٠	٠.٧١	١.٦١	١.٦٥	٢.٥١	٢.٥٢	١.٢١	١.٢٥	٣.٧٢	٣.٧٧	١.٣١	١.٣٤
٢٠ g N + ٢٠ g P + ٢٠ g K/ plant	١.٦٠	١.٦٥	٠.٧٥	٠.٧٦	١.٧١	١.٧٩	٢.٦١	٢.٦٦	١.٣١	١.٣٤	٣.٩٢	٤.٠٠	١.٤١	١.٤٤
٣٠ g N + ٥ g P + ٥ g K/ plant	١.٩٥	٢.٠٠	٠.٥٠	٠.٤٨	١.٣٧	١.٤٤	٢.٢١	٢.٢٧	١.٠٥	١.١٠	٣.٢٦	٣.٣٧	١.١١	١.١٤
٣٠ g N + ١٠ g P + ١٠ g K/ plant	١.٨٨	١.٩٣	٠.٥٥	٠.٥٧	١.٤١	١.٤٨	٢.٣٠	٢.٣٨	١.١٠	١.١٦	٣.٤٠	٣.٥٤	١.٢٠	١.٢٥
٣٠ g N + ٢٠ g P + ٢٠ g K/ plant	١.٨٠	١.٨٥	٠.٦٠	٠.٦١	١.٤٦	١.٥٣	٢.٣٩	٢.٤٨	١.١٧	١.٢٥	٣.٥٦	٣.٧٣	١.٢٥	١.٣٠
New L.S.D at ٥ %	٠.٠٦	٠.٠٧	٠.٠٣	٠.٠٣	٠.٠٤	٠.٠٤	٠.٠٩	٠.١٠	٠.٠٤	٠.٠٤	٠.٠٩	٠.٠٨	٠.٠٤	٠.٠٤

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"تحديد الكميات المثلي من الأسمدة النيتروجينة والفوسفاتية والبوتاسية اللازمة لتعظيم النمو والأزهار في نباتات الفل"

أحمد إبراهيم القبيعي

قسم زراعة المناطق الجافة كلية الأرصاد والبيئة وزراعة المناطق الجافة

جامعة الملك عبد العزيز - جدة – المملكة العربية السعودية.

أجريت هذه الدراسة خلال موسمى ٢٠٠٨، ٢٠٠٩ لاختبار تأثير الجرعات المختلفة من التسميد بالنيتروجين والفوسفور والبوتاسيوم علي خصائص النمو والأزهار وكذلك الحالة الغذائية لنباتات الفل. كذلك إختبار أفضل جرعة من النيتروجين والفوسفور والبوتاسيوم.

أشارت نتائج الدراسة إلى أن التسميد بالنيتروجين بمعدل ٢٠ – ٣٠ جرام للنبات، الفوسفور والبوتاسيوم بمعدل ٥ – ٢٠ جرام للنبات يؤدي إلي تحسين جميع صفات النمو الخضرى وهى ارتفاع النبات، عدد الأوراق للنبات ومساحة الورقة والمساحة الكلية لأوراق النبات كذلك صفات الأزهار مثل عدد الأزهار علي النبات والوزن الطازج للأزهار علي النبات والعناصر (النيتروجين والفوسفور والبوتاسيوم) والصبغات النباتية (كلوروفيل أ ، ب ، الكلوروفيل الكلي والكاروتينات) وذلك بالمقارنة بمعاملة الكونترول (عدم التسميد). أما متوسط الوزن الطازج للزهرة المفردة فقد كان يميل للانخفاض بمعاملات التسميد النيتروجيني والفوسفاتي والبوتاسي وذلك بالمقارنة بعدم التسميد ولقد أدي زيادة الجرعة المستخدمة من النيتروجين من ٢٠ إلي ٣٠ جرام للنبات إلي تحسن جميع صفات النمو الخضري والوزن الطازج للزهرة والنسبة المئوية للنيتروجين كما أدي إلي حدوث انخفاض في بعض صفات الأزهار مثل عدد الأزهار علي النبات والوزن الطازج للأزهار علي النبات، النسبة المئوية للفوسفور والبوتاسيوم والصبغات النباتية. وكان هناك تحسن ملحوظ في جميع صفات النمو الخضري وعدد الأزهار علي النبات والوزن الطازج للازهار والنسبة المئوية للفوسفور والبوتاسيوم والصبغات النباتية وذلك بزيادة الجرعة المستخدمة من عنصري الفوسفور والبوتاسيوم من ٥ الي ٢٠ جرام للنبات فقط فإن كل من الوزن الطازج للزهرة والنسبة المئوية للنيتروجين كانت تميل للنقص التدريجي بزيادة الجرعة المستخدمة من عنصري الفوسفور والبوتاسيوم.

لأجل تحسين خصائص النمو والأزهار في نباتات الفل فإنه ينصح بتسميد النباتات بالنيتروجين والفوسفور والبوتاسيوم بمعدل ٢٠ جرام للنبات من كل عنصر.