بررسی میزان تنوع جمعیت چای تحت کشت در منطقه شرق چایکاری

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چکیده

یکی از مهمترین محصولات کشاورزی در استان گیلان گیاه چای (*Camellia sinensis* (L.) O. Kuntze) می‌باشد. تنوع جمعیت منطقه شرق چایکاری غرب با تعداد چهارده ژنوتیپ تحت کشت و چهار کلون وارداتی از گرجستان توسط کاربرد ۱۰ آغازگر ISSR مورد بررسی قرار گرفت. این نشانگرها تولید ۸۲ باند چند شکل و ۱۷ باند یک شکل در کل نمودند. که آغازگرهای P5 با تولید ۱۰ باند چند شکل بیشترین باند چند شکل و آغازگر P11 با تولید شش باند چند شکل کمترین باند چند شکل را تولید نمود. در صد چند شکلی کل نیز حدود ۸۲/۸۳ درصد بدست آمد. بر اساس این داده‌ها میزان شاخص شانون (I)، ضریب تشابه نی (h)، تنوع ژنتیکی کل در جمعیت‌ها (Ht)، تنوع درون جمعیتی (Hs) و تفاوت ژنتیکی بین جمعیت‌ها (Gst) به ترتیب ۰/۶۰، ۰/۴۱، ۰/۳۷، ۰/۳۲ و ۰/۱۳بدست آمدند.

کلمات کلیدی: چای، تنوع جمعیتی، نشانگر مولکولی، ISSR

مقدمه

مهمترین گیاهان نوشابه‌ای غیر الکلی در دنیا گیاه چای از خانواده Theaceace با نام علمی *Camellia sinensis*(L.) O.Kuntze ، می‌باشد. زادگاه این گیاه کشور چین و منطقه یونا می‌باشد. پایه و اساس ژنتیک چای ایران از سه واریته بذر عمومی Dhonjan، Rajghu و Betjan تشکیل شده است. تمام سه واریته چای (*C. sinensis* var. sinensus (L.) O. Kuntze فرم چینی، *C. sinensis* var. asamica (Msaters) فرم آسامی و *C. sinensis* subspecies lasioclyx (Planch) فرم کامبوجی) به شدت دگرگرده افشان می‌باشند(Roy & Chakraborty, 2007) بنابر این جمعیت‌های موجود ترکیبی از این سه گروه می‌باشند (Banerjee, 1992 و Wight, 1962). با کار برد نشانگرهای مولکولی متعددی مانند RFLP، AFLP، SSR و ... اطلاعات ژنتیکی قابل توجی در ارتباط با ژنتیکی گیاه چای تا به امروز تهیه شده است اما متاسفانه در این مورد در کشور ایران فعالیت چندانی صورت نگرفته‌است. از نشانگرهای متعددی برای بررسی روابط ژنتیکی در گیاه چای استفاده شده است (Paul *et al.*, 1997، Devarumath *et al.*, 2002، Roy & Chakraborty, 2007، جهانگیرزاده خیاوی و همکاران، ۱۳۹۵، جهانگیرزاده خیاوی و فلک‌رو، ۱۳۹۵). در مطالعه حاضر نویسندگان از نشاگر ISSR را برای بررسی بررسی روابط و ساختار بین جمعیتی مابین جمعیت‌های چای تحت کشت و استفاده نموده‌اند.

موادوروش‌ها

برگ‌های جوان بالغ و کامل شده ۱۸ نمونه از ایستگاه تحقیقاتی چای شهید چمران نشتارود بعنوان کلکسیون منطقه شرق چایکاری شامل ۱۴ نمونه جمع آوری شده از سطح منطقه و چهار کلون وارداتی از گرجستان تهیه گردید.

استخراج DNA ژنومی از نمونه‌های برگی، به روش دلاپورتا با اندکی تغییر در آزمایشگاه بیوتکنولوژی پژوهشکده چای لاهیجان صورت گرفت. برای بررسی واکنش زنجیره‌ای پلیمراز، ۱۰ آغازگر ISSR مورد استفاده قرارگرفت. مخلوط واکنش زنجیره‌ای پلیمراز و شرایط آن بر اساس روش بکار برده شده توسط جهانگیرزاده خیاوی و همکاران (۱۳۹۷) تنظیم شد. محصولات تکثیر شده به نسبت ۵ میکرولیتر محصول PCR، ۳ میکرولیتر بافر بارگذاری و ۲ میکرولیتر محلول safe stain در ژل آگارز ۱/۵ درصد تحت ولتاژ ثابت ۹۰ ولت به مدت ۱۲۰ دقیقه تفکیک گردیدند. به باندهای دارای وضوح مطلوب بر اساس حضور باند یا عدم حضور باند یک و صفر داده شد. جهت آنالیز جمعیتی نیز از نرم افزار POPGENE,Ver.32 استفاده گردید.

نتایج و بحث

با توجه به نمونه‌های مورد بررسی می‌توان نمونه‌ها را در دو جمعیت متفاوت، جمعیت منطقه شرقی چایکاری با ۱۴ عضو، جمعیت وارداتی از گرجستان با چهار عضو قرار داد. جهت بررسی میزان تنوع ژنتیکی درون زیرجمعیت‌ها؛ شاخص‌های میانگین، تعداد نوارهای مشاهده شده و میانگین تعداد نوار مؤثر، شاخص تنوع ژنتیکی نی و شاخص اطلاعاتی شانون درون هر جمعیت محاسبه شد (جدول۱). همانطور که مشاهده می‌گردد میزان شاخص‌های محاسبه شده به یکدیگر بسیار نزدیک می‌باشد که دلیل آن به انشعاب تمام بوته‌های چای از یک منبع و تعداد محدودی گیاه باز می‌گردد.

جدول ۱- تعداد نمونه در هر جمعیت، متوسط تعداد نوار مشاهده شده، متوسط تعداد نوار مؤثر، شاخص تنوع ژنتیکی نی و شاخص تنوع ژنتیکی شانون در جمعیت‌ها و کل جمعیت

جمعیت	تعداد نمونه درون هر جمعیت	متوسط تعداد نوارمشاهده شده (na)	متوسط تعداد نوار موثر (ne)	شاخص تنوع ژنتیکی نی (h)	شاخص تنوع ژنتیکی شانون (I)
منطقه شرقی چایکاری	۱۸	۲	۱/۷۶	۰/۴۲	۰/۶۰
نمونه‌های گرجستان	۴	۱/۵۵	۱/۴۱	۰/۲۳	۰/۳۱
کل	۲۸	۲	۱/۷۳	۰/۴۱	۰/۶۰

در ادامه آنالیز جمعتی نمونه‌های مورد بررسی، شاخص‌های تنوع کل جمعیت، تنوع درون زیر جمعیت‌ها، تنوع بین زیر جمعیت‌ها مورد بررسی قرار گرفتند (جدول۲).

جدول ۲- شاخص‌های تنوع کل جمعیت، تنوع درون زیر جمعیت‌ها، تنوع بین زیر جمعیت‌ها محاسبه

	تعداد نمونه	تنوع کل (ht)	تنوع درون جمعیت (hs)	تنوع بین جمعیت (Gst)	جریان ژنی
میانگین	۲۸	۰/۳۷	۰/۳۲	۰/۱۳	۳/۳۷
انحراف از معیار	-	۰/۰۱	۰/۰۱	-	-

با توجه به Gst به دست آمده مشخص می‌گردد که تنوع ژنتیکی درون جمعیت (Gst) حساب شده بسیار کم می‌باشد. در بررسی‌های گذشته نیز نتایج مشابهی گزارش شده است (Ht=۰/۳۸، Hs=۰/۲۷ و Gst=۰/۲۵) (Roy & Chakraborty, 2007) و (Ht=۰/۴۲، Hs=۰/۳۷ و Gst=۰/۱۱) (جهانگیرزاده خیاوی و همکاران، ۱۳۹۶) که تایید کننده نتایج ما می‌باشد.

منابع

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Investigating population diversity of cultivated tea in the eastern part of the tea industry

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Abstract

One of most important crop in north of Iran is tea (*Camellia sinensis* (L.) O. Kuntze). Population diversity of eastern part of the tea industry with 14 cultivated genotypes and four import clones from Georgia were investigated by used of 10 ISSR primes. These primers were amplified 82 polymorphic band and 17 monomorphic bands. Primer P5 by amplifying 10 polymorphic bands showed maximum number of polymorphic bands and P11 by amplifying 6 polymorphic bands showed minimum number of polymorphic bands. Polymorphic percent calculated 82.83. According to this data Shannon's Information index (I), Nei's gene diversity (h), total genetic diversity in populations (HT), major portion of it was within populations (HS) and the genetic differentiation among populations (GST) was calculated 0.60, 0.41, 0.37, 0.32 and 0.12 (respectively).

***Keywords*:** Tea, Population diversity, Molecular Markers, ISSR

Effect of Putrescine and Different Media on Vegetative Growth, Floret and Some Biochemical Parameters of Gladiolus *(Gladiolus grandiflorus* L.) under Soilless Conditions

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Abstract

This experiment was conducted to evaluate the effect of putrescine (50 and 100 ppm) and coco peat: perlite medium with three ratios (v/v) (1:1, 3:1 and 1:3) on some vegetative growth, floret and some biochemical parameters of gladiolus cv. (Strong) under soilless condition in 2016. Data indicated that most criteria of vegetative growth expressed as plant height, leaf number and leaf area, floret parameters as floret number, floret fresh weight and floret dry weight and biochemical parameters as chlorophyll (a), chlorophyll (b) and total chlorophyll significantly increased by putrescine 100 ppm (118.28 cm, 10.53, 72.11 cm^2, 15.69, 10.64 g, 5.42 g, 3.12 mg/g, 1.60 mg/g and 4.72 mg/g) respectively. In terms of media the same traits (113.46 cm, 10.50, 47.18 cm^2, 16.75, 10.57 g, 5.35 g, 3.15 mg/g, 1.71 mg/g and 4.87 mg/g) respectively, significantly increased by the coco peat: perlite medium with ratio (1:3). Interaction between putrescine and media in term of plant height, leaf area and floret number was significant (124.33 cm, 493.67 cm^2 and 18.32) respectively, by putrescine 100 ppm and coco peat: perlite medium with ratio (1:3).

Key words**:** Gladiolus, Putrescine, Soilless, Coco peat, Perlite

Introduction

Gladiolus is very popular and important bulbous ornamental flowering plant of the world. It is known as queen of bulbous flowers. It belongs to the family Iridaceae and is a native of Mediterranean region. It is excellent for cut flowers as it lasts long in flower vase and has magnificent inflorescence with variety of colours (Mahadik and Neha, 2015). Gladiolus is the second most popular flower in the world, especially from the commercial point of view. Gladiolus has great economic value and wide market in world (Khan et al., 2012).
PAs are low molecular weight polycations, organic, biogenic amines that are found in all eukaryotic and most prokaryotic cells (Kumar et al., 1997; Mahgoub et al., 2006) and have profound effects on growth, development and senescence in eukaryotic cells (Casiro and Marton, 2007). In plants, di-amine putrescine (Put), triamine spermidine (Spd) and tetra-amine spermine (Spm) are frequently present in amounts varying from micromolars to more than millimolars (Kakkar and Sawhney, 2002). Polyamines (Put, Spm and Spd) are recognized as a new class of plant growth bioregulators (Dantuluri et al., 2008). They influence many biochemical and physiological processes such as cell division, cell elongation, flowering, fruit set and development, fruit ripening, senescence, storage life (Cohen, 1998). In recent years, some problems in soil culture (such as salinity and unsuitable soil characteristics) and limitation of water resources in many countries, especially in Iran, causes the expansion of soilless culture. Soilless cultures an artificial means of providing plants with support and a reservoir for nutrients and water. The use of soil in protected agriculture is facing many limitations in this country. After years of cultivation, deterioration in soil fertility and increase in soil salinity, in addition to the increase of soil-borne diseases and limited productivity of crops, have often been observed. Therefore, utilizing substrate-based agriculture is a logical alternative to the current soil-based production approach in the country. Hydroponic scientist with a lot of examination had resulted that the growth of plant has not needed soil if grower supply nutrient elements for plants by fertilization (Papadopolus, 1994). Dobrzansks (1981) reported that the yield of gladiolus flower was highest in peat and lowest yield was found in lignite soil. Leinfelder and Rober (1989) used peat + clay, rockwool, foam, perlite and clay for raising gladiolus. They found that flower quality was similar in peat + clay, rockwool and foam, but was very inferior in clay. Sorokina et al. (1984) reported that bark and peat mixture was the best media for growing ornamental plants. Ahmed (1989) reported that sand + peat, sand + leaf mould enhanced the flowering, number of flower and flower size significantly. Magnani et al. (2003) reported that Lapillus was compared to a traditional substrate with perlite and alternative ones with coconut fibre, either single or in a mixture can give excellent productions for the bulbous species tested. Lapillus gave good results with gladiolus, similar to those with traditional perlite, with regards to the qualitative characteristics of the stem (fresh weight and height). Slight decrease in the qualitative characteristics of lily was observed when the lapillus was used singly, whereas it allowed us to obtain very satisfying results when used in a mixture with coconut fibre. Tribulato et al. (2003) reported that among substrates, lavic basalt mixed with peat led to higher

values of stem length and thickness and fresh weight of cut flowers. The highest plant density slightly decreased product quality, thus it seems possible to grow a high number of plants per square meter and increase the yield. Tehranifar et al. (2011) reported that the effect of three soilless media on growth and development of two types of *Lilium* The media were 100% coco peat, 50% gravel + 50% sand and 40% peat + 60% perlite. In general, the media of 50% gravel + 50% sand was equal compared with two other media in most of the measured traits. The aim of this work was to study the responses Gladiolus to the interactive effects of Putrescine and different media.

Material and methods

This experiment was conducted at the glasshouse of the Department of Horticultural Science and Landscape, Faculty of Agriculture, Ferdowsi University of Mashhad, Iran, in 2016 to study the effects of putrescine (50 and 100 ppm) and two media (coco peat: perlite) with three ratios (v/v) (1:1, 3:1 and 1:3) on plant height, leaf number and leaf area, floret parameters as floret number, floret fresh weight and floret dry weight and biochemical parameters as chlorophyll (a), chlorophyll (b) and total chlorophyll of gladiolus cv.(strong) under soilless conditions. The corms used in the experiment were purchased from a local commercial in (Mahallat). The mean size of these corms was 2.5 cm in circumference. Two factors were utilized in this study first factor putrescine (control, 50 and 100 ppm) and second factor two media (coco peat: perlite) with three ratios (v/v) (1:1, 3:1 and 1:3) were investigated. The pots were filled by the medium (10 kg/pot) with three ratios (v/v) (1:1, 3:1 and 1:3), and then three healthy corms were planted at the depth of 10 cm the size of pot was (25 cm X 40 cm) in May 2016 with an soilless open system. Plants were irrigated 2 times every day for 5 min (the amount of water was ½ litters per each pot per day). Four weeks after planting plants were sprayed with different levels of putrescine in related treatments at the rates of 50 and 100 ppm and sprayed again before two weeks of flowering. To facilitate putrescine absorption, a few drops of twin 20 (Merck) were added to spray solutions. Bed leaching was done weekly to prevent the salt accumulation. Hoagland solution were set for pH=6 and EC=2 dS/ m^{-1}. The glasshouse day and night temperatures were 24/20°C during the experiment. Relative humidity was adjusted at 50% and the light intensity averaged 90 mmol/m^2/s^{-1} during the day. The standard cultural practices were followed during the entire growing period of the crop. The experiment was laid out in factorial based on completely randomized design with three replications. The observations related to the different physiological and biochemical parameters were recorded at the end of the experiment. Plant height was calculated by measuring the length from the base of plant to the tip of the florets. Leaves number was measured by counting the leaves of 3 plants. Leaf area (cm^2) was determined by leaf area meter device (AM 100, England). The total numbers of flowers per spike of 3 plants were counted and average was computed. The freshly harvested of 3 florets were weighed on an electric balance in grams. The harvested of 3 florets were oven dried well at 65 ^oC for 48 hours. The dried florets samples were weighed on an electric balance in grams. Chlorophyll contents were measured according to the method described by Rami and Porath (1980). Analysis of the data was performed by JMP8 software and mean values were compared by using Multiple Duncan's test.

Results and discussion

Vegetative Growth:

Plant height (cm): The results regarding height of plant showed the significant difference between the spraying putrescine, where higher plant height was obtained in putrescine 100 ppm (118.28 cm) comparison with control (91.56 cm). In terms of media the higher plant in coco peat: perlite medium with the ratio of 1:3 (113.46 cm), while the lowest plant height found in coco peat: perlite medium with the ratio of 3:1 (95.25 cm) Table. 1. As the results showed, there was a significant interaction between different treatments of putrescine and different media; the highest plant height was obtained by the putrescine 100 ppm and coco peat: perlite medium with the ratio of 1:3 (124.33 cm) and the shortest plant height was obtained by control and coco peat: perlite medium with the ratio of 3:1 with (81.59 cm) Fig.1.

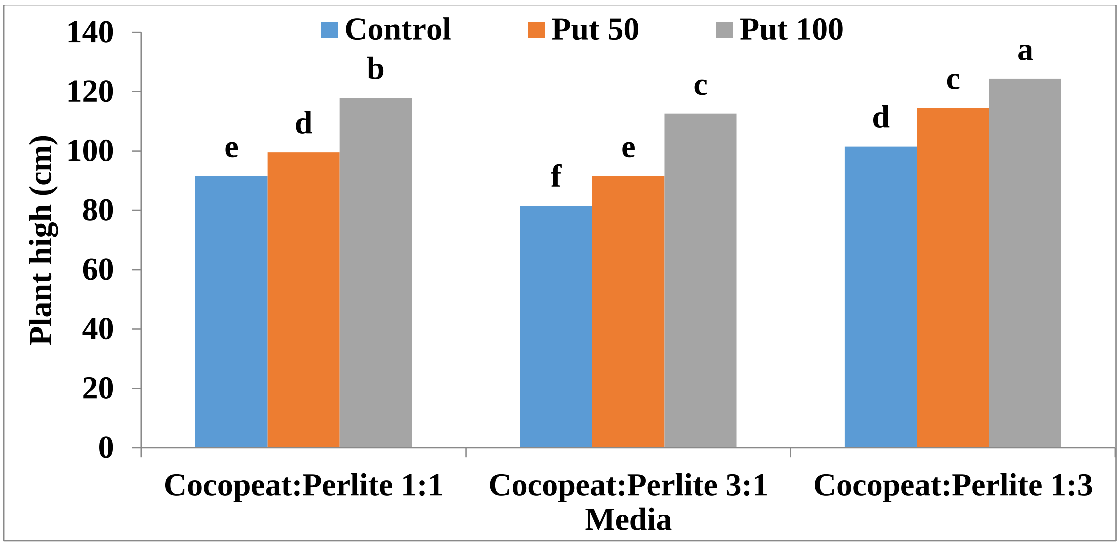

Fig. 1: Interaction effects of different treatments of putrescine and different media on plant high (cm) of gladiolus under soilless condition

Number of leaves per plant: The results showed that, in terms of leaves number per plant, there was significant difference between the different treatments of putrescine, so that the putrescine 100 ppm showed higher number of leaves (10.53 per plant) than control (8.47 per plant). Furthermore, in media with different ratios, the highest number of leaves per plant was obtained in coco peat: perlite medium with the ratio of 1:3 (10.50 per plant) when compared with coco peat: perlite medium with the ratio of 3:1 was the lowest (8.41 per plant) Table. 1).

Table 1: Main effects of putrescine and different media on height of plant, leaf number and leaf area (cm^2) of gladiolus under soilless conditions.

Putrescine	Plant height(cm)	Leaf number	Leaf area (cm^2)
Control	91.56c	8.47c	63.63c
50 ppm	101.87b	9.40b	66.77b
100 ppm	118.28a	10.53a	72.11a
Media			
Coco peat: perlite (1:1)	103.00b	9.50b	44.09b
Coco peat: perlite (3:1)	95.25c	8.41c	42.22c
Coco peat: perlite (1:3)	113.46a	10.50a	47.18a
Significance levels:			
Putrescine	*	*	*
Media	**	*	*
Putrescine x Media	*	ns	*

Columns and main effects followed by different letters are significantly different at $P<0.05$, Duncan's multiple range test. ns: not significant; *, **significant at $P<0.05$, $P<0.01$, respectively.

Leaf area: According to the data exhibited in Table (1), the different treatments of putrescine, showed significant difference from each other in terms of leaf area, so that the putrescine 100 ppm had higher leaf area (72.11 cm^2) compared to the control (63.63 cm^2). Furthermore, among the media, plants produced in coco peat: perlite with ratio of 1:3 had the highest leaf area (47.18 cm^2), while plants in coco peat: perlite (3:1 ratio) showed the lowest leaf area (42.22 cm^2). Based on the results, there were significant interactions between the different treatments of putrescine and different media, the highest leaf area was obtained by the putrescine 100 ppm and coco peat: perlite medium with the ratio of 1:3 (49.64 cm^2) and the shortest leaf area was obtained by control and coco peat: perlite medium with the ratio of 3:1 (40.55 cm^2) Fig.2.

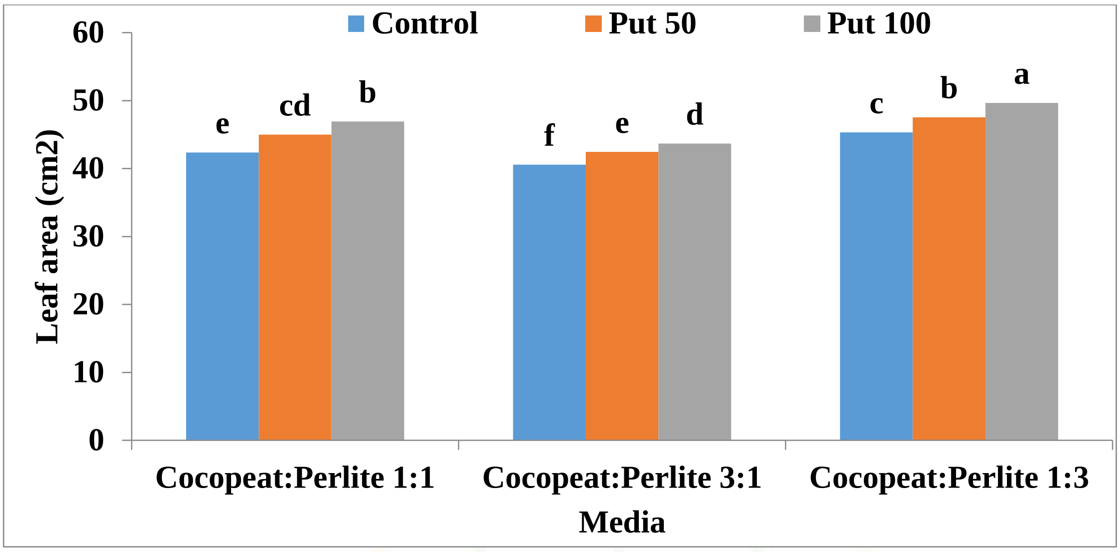

Fig. 2: Interaction effects of different treatments of putrescine and different media on leaf area (cm^2) of gladiolus under soilless condition

Flowering parameters

Number of florets per spike: As can be seen in Table (2), there was significant difference between the different treatments of putrescine regarding number of florets per spike, so that the putrescine 100 ppm had higher number of florets per spike (15.69 per spike) compared to the control (11.64 per spike). Furthermore, among the media, plants produced in coco peat: perlite with ratio of 1:3 had the highest number of florets per spike (16.75 per spike), while plants in coco peat: perlite (3:1 ratio) showed the lowest number of florets per spike (11.64 per spike). The results also showed there were significant interactions between the different treatments of putrescine and different media, the highest number of florets per spike was obtained by the putrescine 100 ppm and coco peat: perlite medium with the ratio of 1:3 (18.32 per spike) and the lowest number of florets per spike was obtained by control and coco peat: perlite medium with the ratio of 3:1 (9.76 per spike) Fig.3.

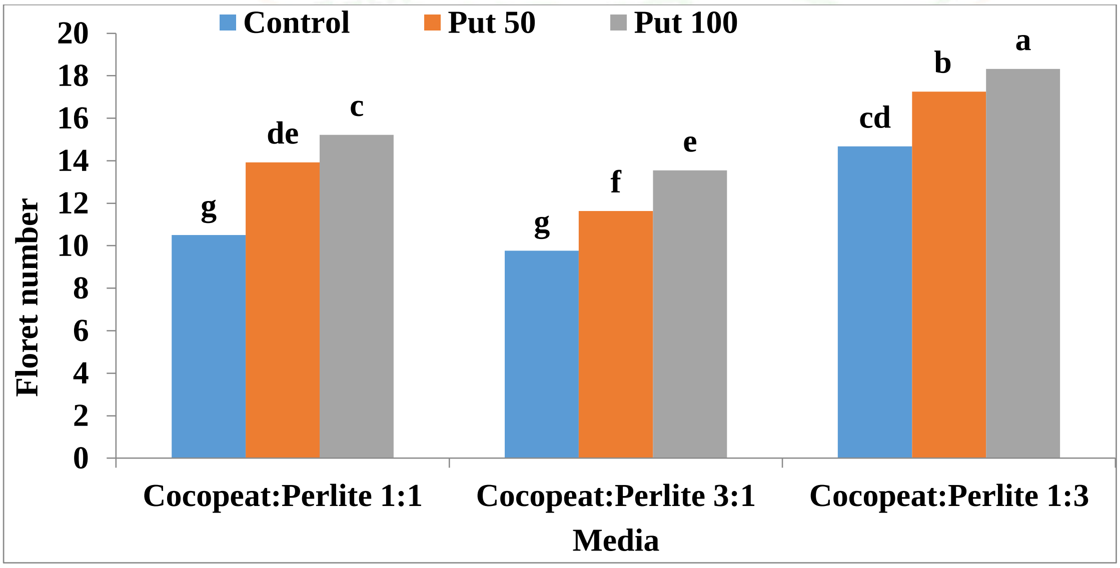

Fig. 3: Interaction effects of different treatments of putrescine and different media on floret number of gladiolus under soilless condition

Florets fresh weight: According to the data exhibited in Table (2), there was significant difference between the different treatments of putrescine regarding florets fresh weight, so that the putrescine 100 ppm had the largest florets fresh weight (10.64g), when compared with control was the smallest (8.29 g). Furthermore, among the media, plants produced in coco peat: perlite with ratio of 1:3 had the florets fresh weight (10.57 g), while plants in coco peat: perlite (3:1 ratio) showed the lowest number of florets per spike (8.47 g).

Florets dry weight: As can be seen in Table (2), there was significant difference between the different treatments of putrescine regarding the florets dry weight, so that the putrescine 100 ppm had the largest florets dry weight (5.42 g), when compared with control was the smallest (3.23 g). Furthermore, among the media, plants produced in coco peat: perlite with ratio of 1:3 had the highest florets dry weight (5.35 g), while plants in coco peat: perlite (3:1 ratio) showed the lowest florets dry weight with (3.37 g).

Table 2: Main effects of putrescine and different media on floret number, florets fresh weight (g) and floret dry weight (g) of gladiolus under soilless conditions.

Putrescine	Floret number	Floret freshweight (g)	Floret dry weight (g)
Control	11.64c	8.29c	3.23c
50 ppm	14.26b	9.60b	4.42b
100 ppm	15.69a	10.64a	5.42a
Media			
Coco peat: perlite (1:1)	13.22b	9.49b	4.34b
Coco peat: perlite (3:1)	11.64c	8.47c	3.37c
Coco peat: perlite (1:3)	16.75a	10.57a	5.35a
Significance levels:			
Putrescine	*	*	*
Media	*	*	*
Putrescine x Media	*	ns	ns

Columns and main effects followed by different letters are significantly different at P<0.05, Duncan's multiple range test. ns: not significant; *, **significant at P<0.05, P<0.01, respectively.

Biochemical parameters:

Chlorophyll a content: The results in Table (3) showed that the different treatments of putrescine significantly differed from each other in terms of chlorophyll (a) content, with putrescine 100 ppm showing higher chlorophyll a content (3.12 mg/g) in comparison with control (2.76 mg/g). In addition, the highest chlorophyll a content (3.15 mg/g) was obtained in plants grown in coco peat: perlite medium (1:3 ratio), while the lowest content (2.73 mg/g) was observed in plants grown in coco peat: perlite medium with ratio (3:1).

Chlorophyll b content: Results presented in Table (3) suggested that chlorophyll (b) content in the different treatments of putrescine was significantly differed from each other, so that putrescine 100 ppm (1.60 mg/g) had higher chlorophyll (b) content than cotrol (1.36 mg/g). Moreover, among the three medium ratios, plants grown in coco peat: perlite (1:3) had the highest content of chlorophyll (b) (1.71 mg/g) compared to the plants grown in coco peat: perlite (3:1) with the lowest chlorophyll (b) content (1.25 mg/g).

Total chlorophyll content: Regarding total chlorophyll content, there was significant difference between the different treatments of putrescine as shown in Table (3); the putrescine 100 ppm (4.72 mg/g) had higher total chlorophyll content in comparison with control (4.12 mg/g). Furthermore, coco peat: perlite (1:3) showed to have the highest total chlorophyll content (4.87 mg/g) among all the three medium ratios, while coco peat: perlite (3:1) showed the lowest total chlorophyll content (3.98 mg/g).

Table 3: Main effects of putrescine and different media on chlorophyll (a), chlorophyll (b) and total chlorophyll (mg/g) of gladiolus under soilless conditions.

Putrescine	Chlorophyll (a) mg/g	Chlorophyll (b) mg/g	Total chlorophyll mg/g
Control	2.76c	1.36c	4.12c
50 ppm	2.94b	1.48b	4.42b
100 ppm	3.12a	1.60a	4.72a
Media			
Coco peat: perlite (1:1)	2.93b	1.48b	4.41b
Coco peat: perlite (3:1)	2.73c	1.25c	3.98c
Coco peat: perlite (1:3)	3.15a	1.71a	4.87a
Significance levels:			
Putrescine	*	*	*
Media	*	*	*
Putrescine x Media	ns	ns	ns

Columns and main effects followed by different letters are significantly different at P<0.05, Duncan's multiple range test. ns: not significant; *, **significant at P<0.05, P<0.01, respectively.

Discussion

As the results showed, there was a significant difference between the different media in all parameters were studied. From the result, it was evident that where perlite rate used more than cocopeat rate (3:1), it caused development vegetative growth, floret quality and biochemical parameters. Whereas cocopeat rate used more than perlite rate (1:3). The possible reason related physical properties of these two media. in perlite particles are loose and more porosity and absorbs water sufficiently, which can be utilized by plant. The cocopeat particles are closely linked with very little space for aeration and high water holding capacity; hence it hinders the vegetative growth and flower quality (Khan *et al*., 2002). Coco peat is organic substrates and perlite is inorganic substrates and when mixed together become more effective in the composting process that can cause the mineralization of organic matter and change the organic forms of N and P to mineral forms (Michael and Heinrich, 2008). Coco peat has high water holding capacity which creates a poor relationship between air and water, leading to low aeration within the medium which affects oxygen diffusion to the roots (Abad *et al*., 2002). Perlite substrate with very low cation exchange capacity (CEC), and good capacity of water absorption and coco peat substrate, with its high water holding capacity and nutrients can be considered as good growing media in soilless culture (Djedidi *et al*., 1999). For these reasons also can obtain the maximum vegetative growth and flower quality. These results are in agreement with those obtained by (Mohamed, 1993) on *Nerium oleander*, *Adhatoda vasica* and *Lantana camara* (Mahmood, 2005) on *Caesalpinia pulcherrima* and *Thevetia peruviana* and (Azza et al., 2010) on *Jatropha curca* L. showed that mixture media significantly increased vegetative growth and flower quality. Using concentration of 100 ppm putrescine significantly increased vegetative growth, floret quality and biochemical parameters. These results may be to polyamine having been implicated in awed range of biological process including growth development and biotic stress responses and cell division, differentiation (Kuechen et al., 2005). Interaction between the mixture media and spraying putrescine at 100 ppm significantly increased vegetative growth, flower quality and biochemical parameters, these results are in accordance with those found by (El-Sallami, 2002) on *Chorisia speciosa* and *Leucaena leucocephala* seedlings, and (El-Khalifa, 2003) on *Dalbergia melanoxylon* plant. With regard to the effect of putrescine treatment, these results are in agreement with those obtained by (El-Quesni et al., 2007) on *Bougainvillea* plants and (Abd El-Aziz et al., 2009) on *Gladiolus* plants.

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