

The effect of spraying dry bread yeast suspension on the vegetative growth characteristics of plant Cultivars *Catharanthus roseus* (L) G. DON.

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Abstract: A pot experiment was conducted during the growing seasons 2013/2014 and 2014/2015 In Faculty of Agriculture, Mansoura University, Egypt to study the effect of yeast extract at a concentration of 4 and 8 gL⁻¹ on some growth characteristics of *Catharanthus roseus*, cultivars rosea and alba. The results of the study indicated that measures of growth represented by the plant, plant height, No. of leaves, leaf dimensions, leaf area were significantly higher in control plant of cv rosea compared with cv alba. yeast extract at both levels increased growth parameters in both cvs, with the lower level 4 gL⁻¹ the most effective for enhancing growth of the above-ground organs whereas the higher one 8 gL⁻¹ was the most effective for enhancing growth of the roots. It was concluded that cultivation of the Rosea is preferred over cv alba because of its superior growth characteristics, Also, the treatment with yeast extract in the form of foliar spray can be used to increase and improve the growth characteristics of *Catharanthus roseus* plant.

Key words: *Catharanthus roseus*; varieties; Cultivation; yeast extract; growth attributes.

Introduction:

Catharanthus roseus (L) G. Don known as *Vinca rosea* is a perennial medicinal plant that belongs to the family Apocynaceae which includes eight species, (*C. coriaceus*, *C. lanceus*, *C. longifolius*, *C. ovalis*, *C. roseus*, *C. scitulus*, *C. trichophyllus*, *C. pusillus*), India is the original home of type *C. pusillus* while the remaining species are endemic to the African island of Madagascar, the Wonka plant is an ornamental plant of therapeutic interest, producing more than 150 indole terpenoid alkaloids (TIAs), some of which show potent and important pharmacological activities (Almagro et al., 2015). Among these, vinblastine (VB) and vincristine (VC) are the most important and these two alkaloids are used as a therapeutic agent against a number of cancers (Maqsood, 2017). The pharmacologically active compounds (vinacristine and vinblastine) are produced from the stems and leaves and are essential for anticancer drugs, while the roots have antihypertensive activity (Al-Zahrany et al., 2019).

C. roseus is a herbal medicinal plant characterized by containing alkaloids scattered in all parts of the plant that are used in the treatment of heart diseases and blood pressure. There are two common cultivars of *C. roseus* that are named based on the color of their flowers, the pink 'Rosea' and the white-flowered 'Alba'. The plant also contains many other secondary metabolites including monoterpenoids, glucosides, steroids, phenols, flavonoids and others. (Amirjani et al., 2015).

One kind of fertilizers used in organic farming is bio-fertilizers and since yeast is organisms (fungi) it has been used as a fertilizer because it contains many nutrients (Kahlel, 2015). Yeast extract (YE) is an important elicitor and is found to be rich in vitamin B-complex. It also contains essential components like chitin, N-acetyl-glucosamine oligomers, B-glucan, glycopeptides and ergosterol (Maqsood, 2017).

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Yeast has become a alternativ to chemical fertilizers that are used safely for humans, animals and the environment. I mentioned that yeast extract contains a protective factor, such as polysaccharides, proteins, amino acids, and several vitamins. In addition, yeast improved plant growth, flowering and fruit formation of some plants by using foliar spray with yeast extract. Some research reported that treating lupine plants with yeast led to an increase in yield and yield traits (Taha et al, 2020).

The aim of this study is the effect of yeast extract on the vegetative growth characteristics of two *C. roseus* cultivars, namely, cv alba and cv rosea.

Materials and Methods:

A Pot experiment was conducted during the seasons 2014/2015 and 2015/2016 in Faculty of Agriculture, Mansoura University, Egypt.

plant material:

to study the effect of yeast extract at a concentration of 4 and 8 gL⁻¹ on some growth characteristics of *Catharanthus roseus*, cultivars cv. rosea and cv. alba. The surface of the seeds was sterilized in a 0.2% HgCl₂ solution for 5 min, then thoroughly washed with tap water, and sown in plastic pots, 25 cm in diameter containing 8 kg of a soil whose main physical and chemical characteristics are illustrated is Table (1).

Table (1). Physical and chemical characteristics of the experimental soil.

Organic matter %	Calcium carbonate	mechanical analysis			%	P.P.M		
		Sand %	Silt %	Clay	N	K	P	TSS
2.1	4.6	38.6	26.2	35.2	0.13	226	13	0.24

Preparation of YE

YE was prepared according to the method of Kobayashi et al. (1980). Dry yeast (*Saccharomyces cerevisiae*) powder at 3, 6 gL⁻¹ was shaken in a medium containing 150 g sucrose, 5 g KH₂PO₄, 2 g MgSO₄.7H₂O, 5 g CaCO₃ and 5 g peptone per 1 liter of distilled water and allowed to grow at 28°C for 3 days. The cells were then collected by centrifugation and washed. Four volumes of distilled water was added to the cell mass, then the mixture was kept at 37°C for 2 h with slow agitation to facilitate autolysis. The autolysate suspension was then subjected to centrifugation at 10,000 x g for 30 min, and the supernatant was used as the CYE.

Pots were irrigated to maintain field capacity and arranged in complete randomized block design with four replications. Thirty days after sowing, seedlings were thinned to leave four uniform seedlings per pot. 45 days after sowing (DAS), yeast extract was sprayed onto foliage till leaves dripping using tween 20, 0.05%, as a wetting agent. Control plants were sprayed with deionized water. One week after the first YE sprayed, a second spray was done using the same concentrations. Each pot received as calcium superphosphate (15.5 % P₂O₅) at the rate of 3 g/ Pot mixed with the soil before sowing. 2 g ammonium sulphate(20.5 % N) and 2 g of potassium sulfate (50 % K₂O)were also added to each pot in two equal doses, 25, 40 DAS. 65 DAS. Samples were collected to study growth metrics, plant height, No. of leaves, leaf dimensions, leaf area and fresh and dry weights of plant organs in cv rosea and cv alba.

statistical analysis:

Data were analyzed by ANOVA using SPSS (version 16.0) and means were compared using Duncan's polynomial test at 5% significance level.

RESULTS:

Effects of yeast extract (YE) on morphological characters of *C. roseus* cvs is shown in Fig (1). Data show that cv rosea was characterized with a more vigorous growth compared with cv alba. Plant height, no of leaves, leaf dimensions, leaf area were significantly higher in cv rosea compared with cv alba. Rosea cv surpassed alba cv in plant height, no. of leaves and leaf area by 19, 41 and 14%, respectively.

YE affected significantly all recorded growth attributes. Plant height, No. of leaves, leaf dimensions, leaf area were increased in response to YE application compared to control (Fig 1). Generally, the lower level (4 gL⁻¹) was most effective for enhancing the growth of vegetative organs and leaf length than the higher level (8 g L⁻¹).

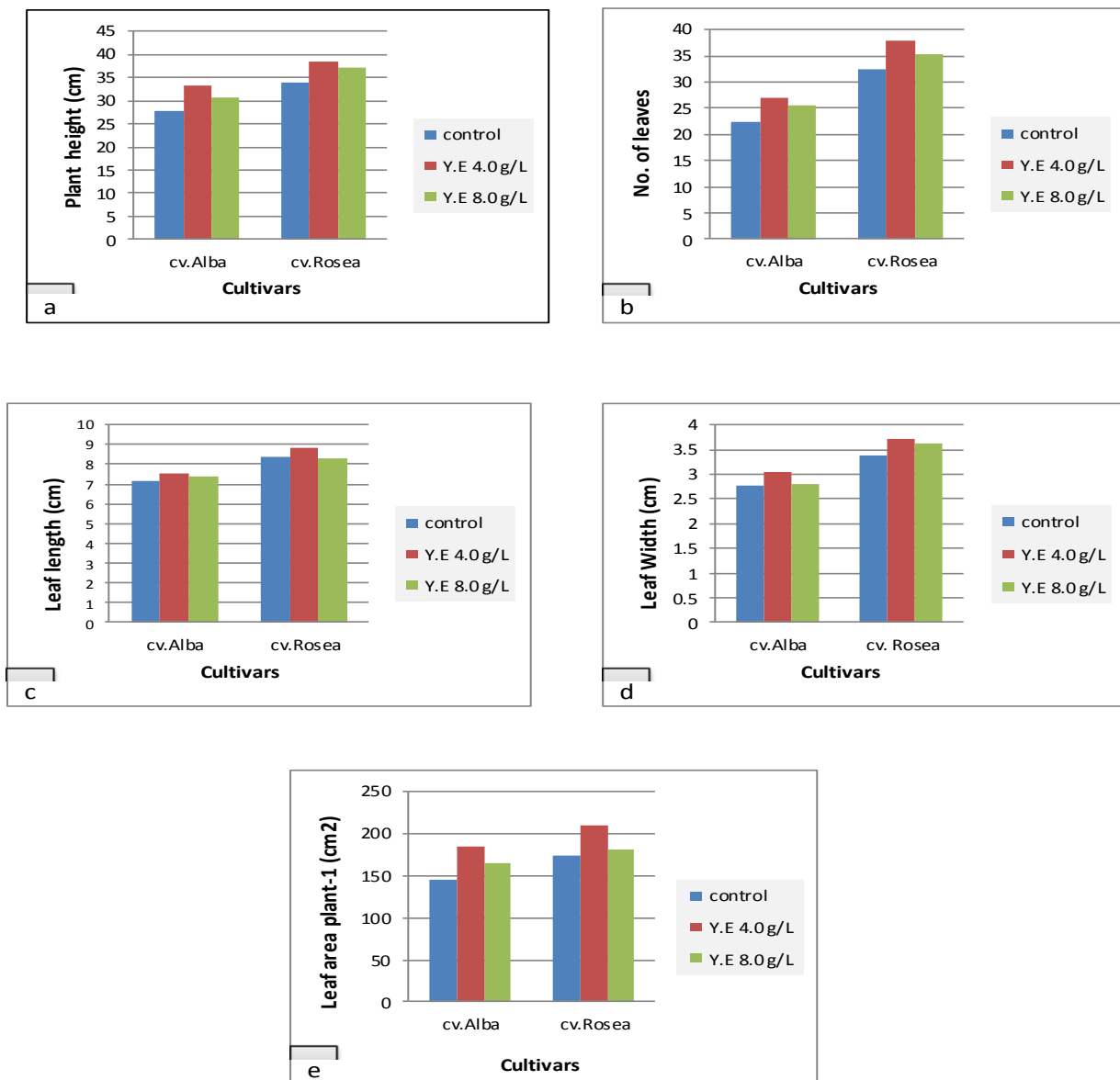


Fig (1): Effects of yeast extract treatments on plant height (a), No. of leaves (b), leaf dimensions (c,d) and leaf area (e) of *C. roseus*.

DISCUSSIONS:

Inter-varietal variations in morphological and growth traits have been recorded (Singh et al., 1992; Jaleel et al., 2008; Idrees et al., 2010). The observed varietal differences in growth trait may be due to the genetic make-up of the variety (Idrees et al., 2010). They attributed these growth-related attributes to higher values of net photosynthetic rates, nitrate reductase and carbonic anhydrase activities as well as higher catels from H,P and K. In addition, Dutta et al., (2005) painted out that variation in morphological traits between *C. roseus* cultivars are regulated primarily at the level of gene expression. Idrees et al. (2010) concluded that the cv rosea of periwinkle is superior to cv alba regarding to growth attributes.

The enhancing effect of YE on growth traits of *C. roseus* plants recorded in the present investigation is in conformity with the results of previous investigations-vegetative growth character of potato plants represented by plant height, leaf area, application of yeast extract and the increase was proportional to the applied level up to 5 gL⁻¹ (Ahmed et al., 2011). In addition, YE irrigated near the plant roots at 4 and 8 gL⁻¹ led to a significant increase in the stems number, leaf area compared with control (Kahlel, 2015). Likewise, growth attributes were increased in response to YE treatment in cucumber (Sarhan et al., 2011 and El-Sagan, 2015) and *Azadirachta indica* (Taha et al., 2016).

YE-induced growth of *C. roseus* plants may be due to its growth-promoting constituents, e.g. mineral elements, amino acids, nucleic acids and vitamins (Kobayashi et al., 1980). In addition, enhancement of tomato growth through the application of YE was attributed to increasing contents of photosynthetic pigments, macro - and micro-elements and endogenous phytohormones (Abou El-Yazied and Mady, 2011). Increasing photosynthetic pigments may enhance photosynthesis process which in turn encourage vegetative growth (Wanas, 2002). Shalaby and El-Nady (2008) suggested that the effect of YE on increasing photosynthetic pigments is may be due to the role of yeasts cytokinins in reducing chlorophyll II degradation and enhancing RNA and protein synthesis thereby enhancing chlorophyll- synthesize enzymes as well as photosynthesis- contributing enzymes. Growth enhancement in response to YE treatments may also due to the increased release of CO₂ through fermentation process that activates the photosynthesis process and carbohydrates biosynthesis (Kurtzmans and Fell, 2006).

CONCLUSIONS:

Based on the results obtained: Cultivation of CV rosea is preferred over CV alba due to its superiority in growth qualities, and thus better production, also, treatment with yeast extract in the form of foliar spray can be used to increase and improve the growth characteristics of the flower plant *Catharanthus roseus*.

تأثير الرش بمعلق خميرة الخبز الجافة في صفات النمو الخضري لأصناف نبات الونكا *Catharanthus roseus*

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المستخلص: أجريت التجربة خلال الموسمين 2015/2014 و 2016/2015 في كلية الزراعة جامعة المنصورة - مصر لدراسة تأثير مستخلص الخميرة بتركيز 4 و 8 جم/ لتر على بعض صفات النمو في نبات الونكا صنف Rosea وصنف Alba. وأشارت نتائج الدراسة أن مقاييس النمو التي يمثلها النبات، عدد الأوراق، أبعاد الورقة، ومساحة الورقة كانت أعلى في الصنف Rosea مقارنة مع الصنف Alba، كما أدت المعاملة بمستخلص الخميرة إلى زيادة مقاييس النمو في كل من الصنفين وكان مستوى 4 جم/ لتر هو الأكثر فاعلية لتعزيز نمو الأعضاء الخضري للنبات بينما كان مستوى 8 جم/ لتر هو الأكثر فاعلية في نمو الجذور.

على ضوء النتائج التي تم الحصول عليها يمكن استنتاج تفضيل زراعة الصنف Rosea على الصنف Alba بسبب تفوقه في صفات النمو، كما أن المعاملة بمستخلص الخميرة على صورة الرش الورقي يمكن أن يستخدم في زيادة وتحسين صفات النمو في نبات الونكا.
الكلمات المفتاحية: نبات الونكا، أصناف، زراعة، مستخلص الخميرة، صفات النمو.

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