J. Product. & Dev., 14(3): 613 – 625(2009)

EVALUATION OF SOME CULTIVARS OF PEAS UNDER ENVIRONMENTAL CONDITION OF UK.

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ABSTRACT

Two field experiments were carried out in 2000 and 2001 seasons at the Experimental Farm (Cockle Park Farm) of the Faculty of Agriculture, Newcastle University to evaluate some cultivars of peas, i.e. Maro, Focus, Quasar and Flare, by studying of their growth characters, yield and its components as well as their photosynthetic activity.

The results showed that *Flare or focus had a higher growth rate of plant length and number of vegetative nodes, while Flare or Quasar, showed higher growth rate of both fresh weight of stem and tendril as well as total dry weight. In addition, green pod yield and its components of pea, i.e. number of pods/plant, number of seeds/plant, pod length and pod thickness were significantly increased in Maro or Focus. Moreover, focus had a greater photosynthetic activity on bottom leaves than the other studied pea cultivars at the first age (71 days from sowing) and the second age (93 days from sowing), while, Maro had a greater photosynthetic activity in the third age (100 days from sowing). On the other hand, on top leaves, cv flare in the first age, had a greater photosynthetic activity and cv Quasar in the second ones, had a good photosynthetic activity. On the contrary, at the third age, the different cultivars not appeared any clear promotion in characters of photosynthetic activity, i.e.e ref, delta e, c ref, delta c, Q leaf, U. Ci, E, 9s and A.*

Conclusively, *it could be concluded that focus had a higher growth rate ,green pod yield and its components of pea, photosynthetic activity on bottom leaves at the first age and the second age.*

Key words: Peas, cultivars, photosynthetic activity.

INTRODUCTION

Pea (*Pisum sativum*, L.) is one of the important vegetable crops grown in UK, which occupies a great figure in the local consumption.

Pea yield could be increased by choice a good cultivars. Some investigators showed that, there were many differences between cultivars of peas which affected by environmental conditions (Amer, 1992 and Ghazal *et al*., 1996 on peas, Shahein *et al*., 1996; Abou El-Salehein and Ghali, 1997 on cowpea, Abou El-Hassan *et al*., 1993; Mohammed and Kandeel, 1994 and Hassan *et al*., 2002 on beans and Abou Khadrah and Zahran, 1984 on soybean).

This work has been designed to evaluate some cultivars of peas by studying growth characters, yield and its components as well as photosynthetic activity of these varieties to choice a good variety for cultivation under environmental conditions of UK.

MATERIALS AND METHODS

The experiments were carried out during 2000 and 2001 seasons at Cockel Park Farm, Newcastle University, England, UK.

Pea seeds of cultivars were sown on 19th of June, 2000 and 2001, at pots in green house **(**diameter of pot, 25 cm).

These experiments were performed to evaluate the cultivars of pea plants, i.e., Maro, Focus, Quasar and Flare by studying plant growth characters, yield and its components and photosynthetic activity. Every variety included six pots and three plants per pot.

The radiation interception was 132.6 Lux, in out of green house and was 81.8 Lux inside of green house.

Seeds were sown in pots and thin into 3 plants when its grown. Soil characteristics of the experimental pots were shown in Table 1:

Table 1. Soil characteristics of the experimental pots

Soil characteristics	Values
Texture class	Clay loam
O.M. %	1.34
pH	7.92
EC (dSm$^-$ at 25^{o}C)	3.20
Available N (ppm)	45.60
Available P (ppm)	7.80
Available K (ppm)	291.00
Available Zn (ppm)	0.81

These treatments were arranged in complete block randomized with three replicates. Normal cultural procedures known for commercial pea production, were followed under the condition of UK soils.

At 84 days from planting, the growth of plants of 3 pots out of cultivated six of every variety were evaluated as follows:

1-Plant length (cm).
2-Stem diameter (cm).
3-Number of vegetative nodes.
4-Number of reproductive nodes.
5-Fresh and dry weight of stems (g).
6-Fresh and dry weight of stipules (g).
7-Fresh and dry weight of tendrils (g).
8-Total dry weight of different parts.

At harvest time, the plants of remained 3 pots were taken from the pots of every treatment and the following data of yield and its components were recorded:

1-Number of pods/plant.
2-Fresh weight of pods/plant.
3-Dry weight of pods (g).
4-Dry weight of seeds (g).

As well as,Physical pod characters:

5-Number of seed/pod.
6-Pod length (cm).
7- Pod width (cm).
8-Pod thickness (cm).

Photosynthetic activity measurements:

Data were taken by LCi apparatus. The LCi (with its leaf chamber) is specifically designed for portability and field use, and provides internal battery suitable for up to 10 hours of continuous operation. Its purpose is to measure the environment of a leaf contained in the jaws of the chamber, and to calculate the photosynthetic activity of the leaf.

The instrument comprises a main console with single conditioning, air supply, microprocessor control, PC (personal computer) card data storage, a-5-button keypad, and a leaf chamber connected by an umbilical cord. The main console supplies air with a relatively stable CO_2 concentration to the chamber at a measured rate. The CO_2 and H_2O concentrations are measured, and the air is

directed over both surfaces of the leaf. The discharged air leaving the chamber is analysed, and its CO_2 content(generally decreased) and H_2O content(increased) determined.

From the differences in gas concentration and the airflow rate, the assimilation transpiration rates are calculated approximately every 20 seconds. A small fan in the chamber ensures through mixing of the air around the leaf. Measurement of CO_2 is by an infrared gas analyser (IRGA). H_2O measurement is by two laser-trimmed humidity seasons. The system also measures leaf temperature, chamber air temperature, PAR (Photosynthetically Active Radiation), and atmospheric pressure. The PAR level at leaf and the radian energy balance of the leaf are calculated. The measurements are carried out in an "Open System" configuration in which fresh gas (air) is passed through the PLC (plant leaf chamber) on a continuous basis. Measurements are carried out on the state of the incoming gas (the "reference" levels) and after passing the leaf specimen (the "analysis" levels), the gas is then vented away. This arrangement tolerates some outward gas leakage and adsorption by the materials used in the gas path. Data were taken at three times during growing of plants in pots as follows:

1- At August (71 days from sowing ,first age).
2- At September (93 days from sowing ,second age).
3- At September(100 days from sowing ,third age).

At these times the following data were recorded:

e ref : water vapour pressure into leaf chamber, m Bar.
delta e : difference in water vapour pressure, m Bar.
C ref : CO_2 flowing into leaf chamber, µ mol mol^{-1}.
delta c : difference in CO_2 concentration through chamber, dilution corrected, µ mol mol^{-1}.
Q leaf: P. A. R. incident on leaf surface µ $mols^{-1}$ m^2
Q leaf = Q x Trw.
Where : Q : Photon flux density incident on leaf chamber window, µ mol m^{-2} s^{-1}.
Trw : Leaf chamber window transmission factor to P. A. R. (given).
S : Span factor, determined during calibration (span adjustment).
U : Molar air flow in mol s^{-1}.
Ci : Sub-stomatal cavity CO_2 concentration, µ mol mol^{-1}.
E :Transpiration rate, mol m^{-2} s^{-1}.
9 s : Stomatal conductance of water vapour, mol $m^{-2}S^{-1}$.
A : Photosynthetic Rate (Rate of CO_2 exchange in the leaf chamber), µ mol m^{-2} s^{-1}.

Statistical analysis:

The obtained data were statistically analyzed according to Snedecor and Cochran (1980) and using L.S.D. test at 5% level of significance to verify the differences between treatments.

RESULTS AND DISCUSSION

Vegetative growth characters:

Results shown in Tables (2 and 3) illustrate that, varieties of peas significantly differed in their growth characters, expressed as, plant length, number of vegetative nodes, number of reproductive nodes, fresh weight of stems, stipules, tendrils and dead. Such data reveal also that, Flare or Focus, showed higher growth rate of plant length, number of vegetative nodes and dead fresh weight and also, Flare or Quasar, showed higher growth rate of both fresh weight of stem and tendril as well as total dry weight of whole plant and dead dry weight. From that, it can be concluded that cv Flare, being the most better than the other cultivars of peas in most of growth characters.

Obtained results are in conformity with those reported by Amer, 1992 and Ghazal *et al*.,1996 on peas, Petel *et al*. (1992) on bean and Shahein *et al*., 1996 and Abou El- Salehein and Ghali, 1997 on cowpea.

Yield and its components:

Data in Table (4) indicate that green pod yield and its components of peas, i.e. number of pods/ plant, pod length and pod thickness, significantly increased in Maro or Focus, while both pod fresh weigh and dry weight, seed dry weight, pod diameter and number of pods insignificantly increased.

These results are in harmony with those obtained by Amer, 1992 and Ghazal *et al*., 1996 on peas and Shahein *et al*., 1996, Abou El-Salehein and Ghali, 1997 on cowpea, Abou El-Hassan *et al*., 1993, Mohammed and Kandeel, 1994 and Hassan *et al*., 2002 on beans and Khadrah and Zahran, 1994on soybean.

Photosynthetic activity:

a) On bottom leaves:

Data in Table (5) indicate that cv Focus had a greater photosynthetic activity than the other of pea cultivars studied in this respect, at the first and second age. The greatest characters of photosynthetic activity were delta e, delta c, Q leaf, E, 9s and A in the first age (71 days from sowing).

In the second age (93 days from sowing), the same cultivars (Focus) had also a good photosynthetic activity expressed as delta e, C ref, E and 9s (Table 6). On the other hand, cv Maro had a greatest photosynthetic activity expressed as, delta e, delta c, Q leaf, E, 9s and A, in the third age (100 days from sowing), (Table 7).

Generally, cv Focus had a good character of studied photosynthetic activity. In addition, Focus may be had a good growth rate (Tables 2 and 3) with active photosynthetic apparatus (Tables 5 and 6) and consequently, highest yield and greatest quality (Table 4).

b) On top leaves:

Data presented in Table 8, illustrate that e ref, c ref, Q leaf, Ci and 9s were significantly increased in cv Flare at the first age of the plants (71 days from sowing), while delta e and E were significantly increased in Focus or Flare at the same age.

On the other hand, at the second age (93 days from sowing, Table 9), obtained data show that e ref, delta c.,Q leaf and A significantly increased in cv Quasar. In addition, at the third age (100 days from sowing, Table 10) the different cultivars not appeared any clear promotion in characters of photosynthetic activity.

Conclusively, it could be concluded that focus had a higher growth rate ,green pod yield and its components of pea, photosynthetic activity on bottom leaves at the first age and the second age.

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تقييم بعض أصناف البسلة تحت الظروف البيئية للمملكة المتحدة

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أجريت تجربتان حقليتان في موسمي ٢٠٠٠ ،٢٠٠١ بمزرعة التجارب (كوكل بارك) التابعة لكلية الزراعة ، جامعة نيوكاسل لتقييم بعض أصناف البسلة وهي فارو ، فوكاس ، كيوسار، فلير لدراسة صفات نموهم الخضري ، المحصول ومكوناته وكذلك كفاءتهم لعملية التمثيل الضوئي .

أوضحت النتائج أن : صنفي فلير وفوكاس لهما معدل نمو عالي في طول النبات ،عدد عقد النمو الخضري والوزن الطازج للأجزاء الميتة ،بينما الصنف فلير وكيوسار، قد اظهرا معدل عالي للوزن الطازج لكلا من الساق والأوراق وكذلك الوزن الجاف الكلي . كما سجل معنويا كل من صنفي مارو و فوكاس أعلي محصول للقرون الخضراء ومكوناته والمتمثلة في عدد القرون على النبات وعدد البذور لكل نبات ، وطول القرن وسمكه.

وزيادة علي ذلك ،قد أعطي صنف فوكاس أعلي كفاءة في عملية التمثيل الضوئي للاوراق القاعدية عن أي أصناف مدروسة أخري في العمر الأول (٧١يوم من الزراعة) والعمر الثاني (٩٣ يوم من الزراعة) ، بينما صنف مارو قد سجل أعلى القيم فى العمر الثالث (١٠٠يوم من الزراعة) .وفي الاوراق القمية ، سجل صنف فلير أعلى القيم فى كفاءة عملية التمثيل الضوئى ، فى العمر الأول ، بينما صنف كيوسار فى العمر الثاني قد سجل كفاءة جيدة في التمثيل الضوئي . على العكس من ذلك، في العمر الثالث ، لم تظهر الأصناف المختلفة أي تشجيع واضح في صفات كفاءة عملية التمثيل الضوئي وهى (ضغط الهواء داخل غرفة الورقة ، الاختلاف في ضغط بخار الماء ، تدفق ثاني أكسيد الكربون داخل غرفة الورقة ، الاختلاف في تركيز ثاني أكسيد الكربون داخل الغرفة ، كثافة الفوتونات على سطح الورقة ، تدفق الهواء ، تركيز ثاني أكسيد الكربون تحت الثغور ، معدل النتح ، معدل مرور بخار الماء من فتحة الثغر ، معدل التمثيل الضوئي).