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Comparison of photosynthesis activities among ten species of *Salvia* L.

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Abstract

The study included survey to record ten species of *Salvia* L. (Lamiaceae) at spring session in three physical district of Iraqi vegetation within Kurdistan region .After identified species of studied genus the study included field investigation of some photosynthetic parameters by PP system TPS-2.the result showed different pattern of these species in compared with the elasticity of geographic distribution especially in Compensation point of CO_2 and the leaf contents of photosynthetic pigments.

Introduction

Salvia L. one of widest in *Lamiaceae* Lidl family including 1000 species compared with other member of genus Lamiaceae 3500 species of 250 genus (kintzios, 2000 and simpson). Al-Hussaini (2006)record 30 species more of them in north of Iraq. These genus show defenses growth forms and secondary metabolites (walker and sytama ,2007)in addition to differences in ecological relationship (Panagiotopolus *etal.*, 2000)

It has been that some aspect this genus not been studied speeially physislogical aspect in addition to it is elasticity and have no interest by researcher (Alziar 1989 and Shirsat *etal.* 2012) Generally saliva are c3 plant in photosynthesis pathway (Waston and Dollwitz ,1992)this study aim to record some parameter of it is physislogical aspect for salvia species grow in their physical district in northern Iraq .

Material and methods

Identification of species:

The studied species achieved according to (Harly etal. 2004 and Al-Hussaini, 2006) and supported by Iraq National Herbarium – Baghdad.

Determination of some physiological parameter related to Photosynthesis:

Different physiological parameter referred below estimated by PP-photosynthesis system TBS-2, according to it is supplied guide of operation within different levels of atmospheric CO_2:

- Reference CO_2 concentration (ppm).
- Differential CO_2 concentration (ppm).
- PAR(Photosynthetically active radiation) (µmol m^{-2} s^{-1}) .
- GC(mmol m^{-2} s^{-1}) Calculated Stomal Conductance.
- Evap (Evaporation) (mmol m^{-2} s^{-1}) .
- (µmol m^{-2} s^{-1}) (Calculated assimulative rate) PN.
- Ci (PPm) (Calculated sub-stomal CO_2concentration.

Result and Discussion:

The field survey record ten species of *Salvia* L.((*S. bracteata* , *S. compressa* , *S. indica* , *S. multicaulis* , *S. palaestina* , *S. sclerea* , *S. sclereopsis* , *S. spinosa* , *S. syriaca* و *S. viridis*) in studied area which identified in field by available references then supported by Iraqi Natural Herbarium – Baghdad, and followed by field measuring of some physiological parameters especially (GC) Calculated Stomatal Conductance, Transpiration , Respiration and Photosynthesis Net. Using the open systems of PPsystem-TS-2 to controlling input and output CO_2 (Atmospheric CO_2 and Humidity) and calculation the (Differential CO_2 concentration) , (PAR) Photosynthetically Active Radiation ,(PN) Net Photosynthetic Rate ,(GC) Calculated Stomal Conductance , Evaporation (Evap) and Calculated sub stomatal concentration (Ci) by controlling

The results in figure (1-10) showed that Compensation point of CO_2(input CO_2 equal to output CO_2) in other form the plant assimilate only the respiration yielding CO_2(Strzalka and Pieter,1999) and Photosynthesis Net is Zero, because the assimilated CO_2 ingoing from metabolism(destroy by respiration).

The resut noted that S. *indica* and *S. palaestina* have Compensation point of CO_2 near to atmospheric CO_2 (360-380ppm) which refer to high retio of respiration in these species which supported by large stom of S. indica and high level of stomatal frequency of S. *palaestina*(figure 11,12).

The decreasing in CO_2 followed by decreasing of photosynthesis activity until reach it is point of compensation which was 290 of S. *spinosa* and 280ppm of S *sclarea* and S. *multicaulis* , also decreasing in photosynthesis activity followed with decreasing in respiration when assimilation continuous in this low point as in *S. compressa, S. syriaca,* and *S. viridis* which arrived less than 200 ppm. For that these species have ability assimilation in low concentration of CO_2 which is normal phenomenon in C4 plant (Sage and Monson. 1999) ,also according to this point the species as (*S. multicaulis ,S. sclarea and S. spinosa*)have characters of C3-C4 intermediate plants in it is photosynthetic pathway ,while other studied species regarded as C3 plants ,this parameter may be useful to classify these large number of species of Salvia in the world in to three categories of photosynthetic pathway.

Other characters such as stomatal conducting was related to leaves anatomy of studied species especially stomata also environmental factors soil and weather may have it is effect (Kapotis etal., 2003 and Miyashita ،2005) in addition to other sources of differences such as elevation and annual changing in precipitation.

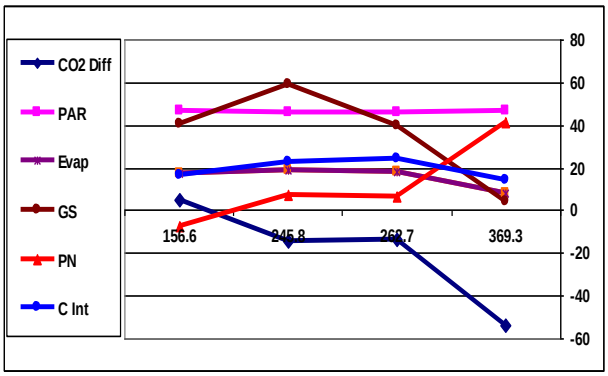

Figure (1) Physiological changes within different concentration of atmospheric CO2 for S.

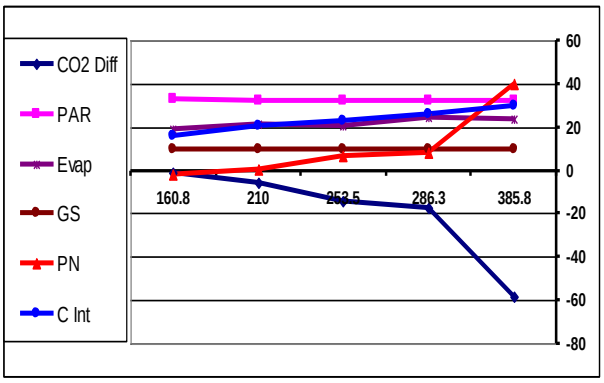

Figure (2) Physiological changes within different concentration of atmospheric CO2 for *S. bracteata*

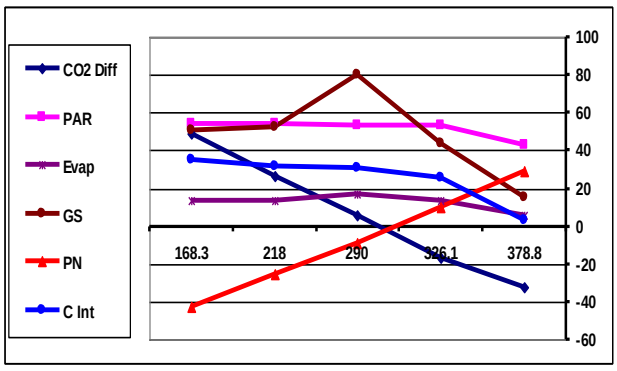

Figure (3) Physiological changes within different concentration of climate CO_2 for *S. multicaulis*

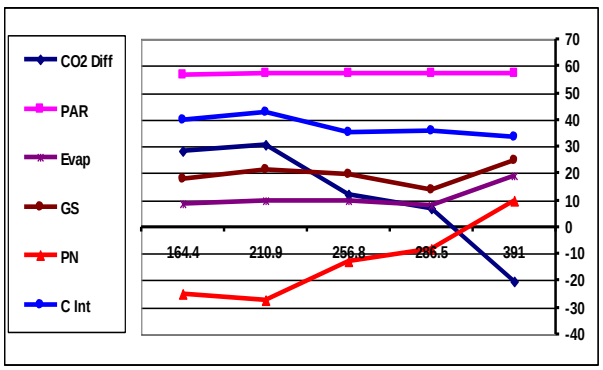

Figure (4) Physiological changes within different concentration of atmospheric CO2 for *S. indica*

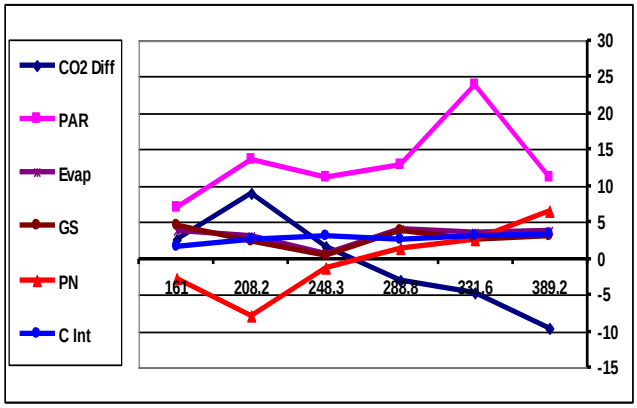

Figure (5) Physiological changes within different concentration of atmospheric Co2 for *S. sclarea*

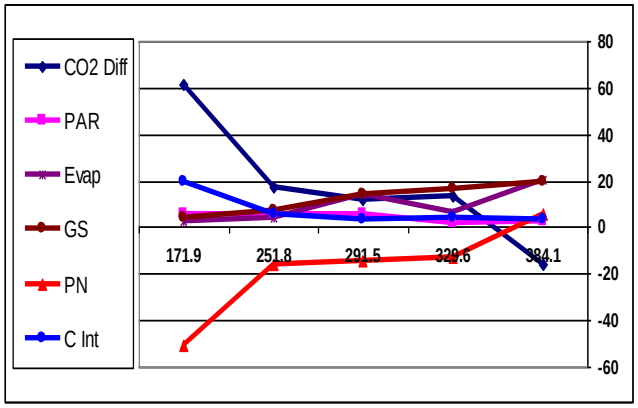

Figure (6) Physiological changes within different concentration of atmospheric Co2 for *S. palaestina*

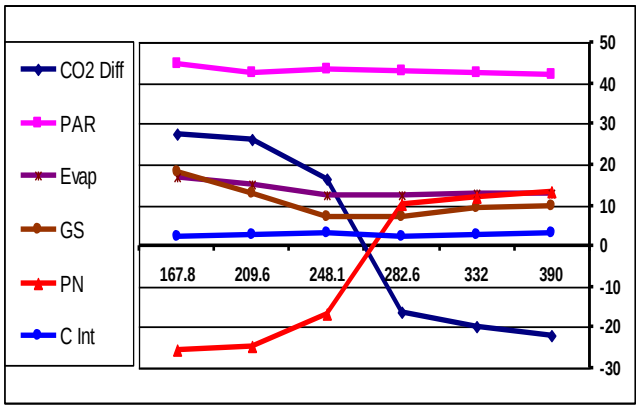

Figure (7) Physiological changes within different concentration of atmospheric Co2 for *S. spinosa*

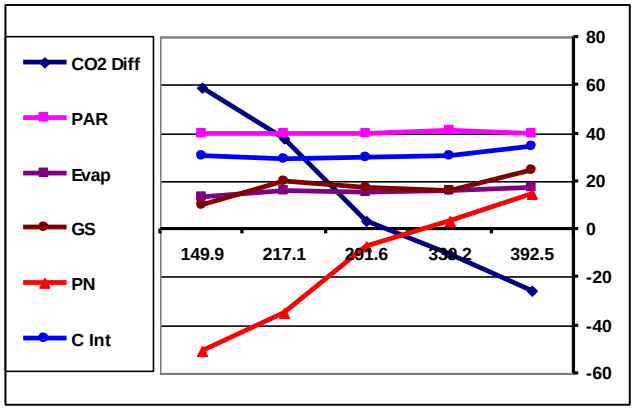

Figure (8) Physiological changes within different concentration of atmospheric Co2 for *S. sclareopsis*

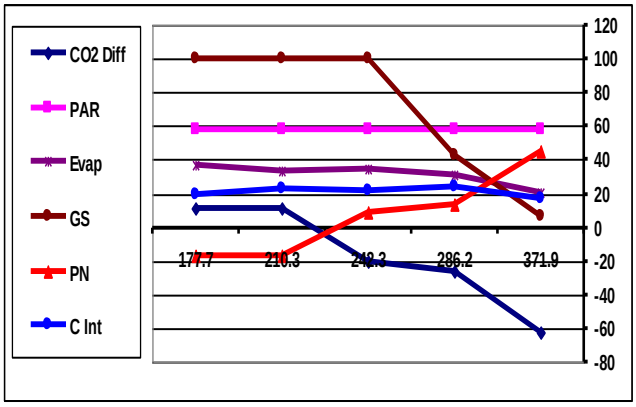

Figure (9) Physiological changes within different concentration of atmospheric Co2 for *S. viridis*

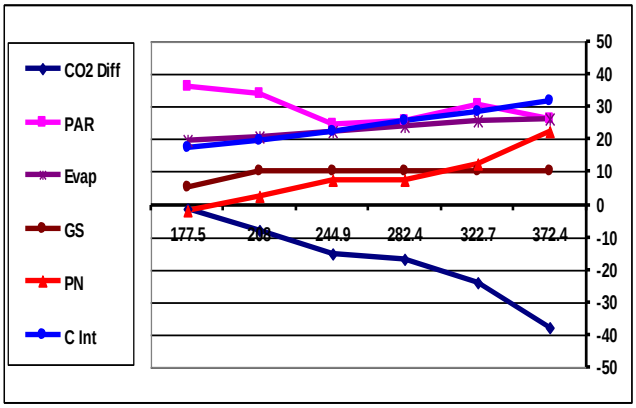

Figure (10) Physiological changes within different concentration of atmospheric Co2 for *S. syriaca*

`Figure 11: Epidermis showed stomatal frequency of *S. palaestina* (A), opening stoma in *S. indica* (B)

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