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 CO₂ and the leaf contents of photosynthetic pigments.

Introduction  

It has been that some aspect this genus not been studied specially physiologival aspect in addition to it is elasticity and have no interest by researcher (Alziar 1989 and Shirsat *et al.*, 2012) Generally saliva are c3 plant in photosynthesis pathway (Waston and Dollwitz, 1992) this study aim to record some parameter of it is physiologival 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 *et al.* 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 CO₂:

- Reference CO₂ concentration (ppm).
- Differential CO₂ concentration (ppm).
- PAR(Photosynthetically active radiation) (µmol m⁻² s⁻¹).
- GC(mmol m⁻² s⁻¹) Calculated Stomatal Conductance.
- Evap (Evaporation) (mmol m⁻² s⁻¹).
- (µmol m⁻² s⁻¹) (Calculated assimulative rate) PN.
- Ci (PPm) (Calculated sub-stomatal CO₂concentration).

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*, and *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 CO₂ (Atmospheric CO₂ and Humidity) and calculation the (Differential CO₂ concentration), (PAR) Photosynthetically Active Radiation, (PN) Net Photosynthetic Rate, (GC) Calculated Stomatal Conductance, Evaporation (Evap) and Calculated sub stomatal concentration (Ci) by controlling.

The results in figure (1-10) showed that Compensation point of CO₂(input CO₂ equal to output CO₂) in other form the plant assimilate only the respiration yielding CO₂(Strzalka and Pieter, 1999) and Photosynthesis Net is Zero, because the assimilated CO₂ ingoing from metabolism(destroy by respiration).

The result noted that *S. indica* and *S. palaestina* have Compensation point of CO₂ near to atmospheric CO₂ (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 280 ppm 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 et al., 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. compressa](image1)

![Figure (2) Physiological changes within different concentration of atmospheric CO2 for S. bracteata](image2)

![Figure (3) Physiological changes within different concentration of climate CO2 for S. multicaulis](image3)

![Figure (4) Physiological changes within different concentration of atmospheric CO2 for S. indica](image4)
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*
References:


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


