

MAIN PHYSIOLOGICAL CHARACTERS LINKED TO NET ASSIMILATION OF SUNFLOWER IN VARIOUS CROPPING CONDITIONS.

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**Poster Summary.** The purpose of this study is to outline the main physiological parameters determining the net assimilation in current conditions of production. In this aim the hybrid cv. Pharaon has been cropped on soils of variable depths, irrigated or not, in populations of 5.6 or 8.9 plants.m<sup>-2</sup> and with N fertilizations of 0, 85 and 170 Kg N.ha<sup>-1</sup>. N was supplied either before planting, or partly by fertilizing irrigation before and after anthesis. On tagged plants representative of plots, leaf areas were measured at intervals of about 12 days ; measures of organs dry matter, N and if appropriate oil content have been made at stages star, beginning of anthesis, petals fall and maturity. The net assimilations performed at these stages were calculated by the coefficients of PENNING de VRIES (1975). On some treatments, determinations of soluble proteins, Rubisco content and activity, and photosynthesis, were practiced on leaves n° 16 and 21. Yields and their components were measured at maturity. The net assimilation performed at each stage is mainly a function of the N uptake, itself depending on soil reserves, fertilization, water supply, and intraspecific competition (figure 1).

Figure 1

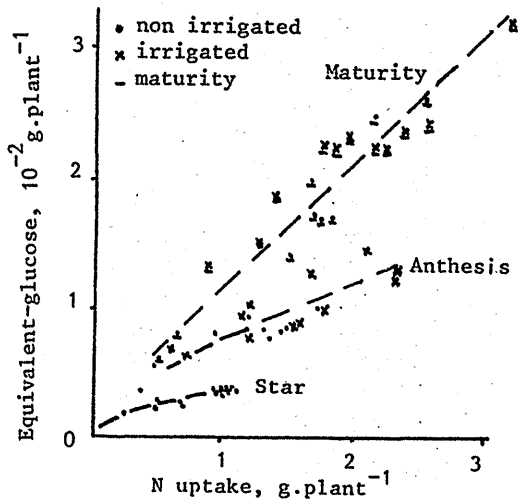


Figure 2

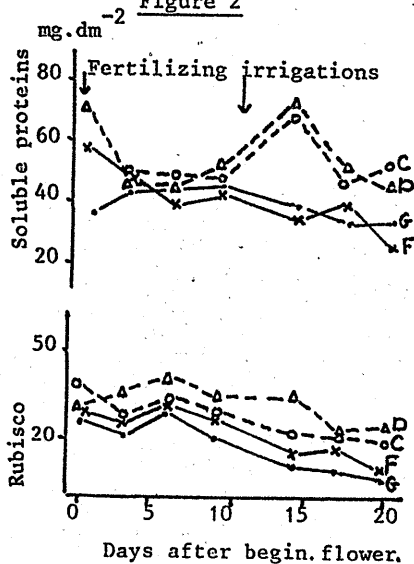


Figure 1 - Equivalent-glucose assimilated at successive stages, as a function of N uptake

Figure 2 - Evolution, during and after flowering, of soluble proteins and Rubisco content of leaf n° 16 ; --- : fertilizing irrigation.

Nitrogen nutrition and water status both determine the leaf area and its duration (table 1). The ratio equivalent-glucose assimilated little varies leaf area duration

(8.2 to 9.5 g equivalent glucose per m<sup>2</sup>.day of leaf area) ; this fact means that a sort of adjustment is reached in each condition between edaphic possibilities, foliage, and assimilation, in spite of large differences of composition and enzymatic activity among leaves of various levels. The upper ones contain more soluble proteins and Rubisco, which has a greater activity. Fertilizing irrigation applied before and after anthesis is N-deficient treatments increases these contents and properties, maintains foliage activity, and allows a good achens filling (figure 2 and table 2). If water is not too limiting, the kinetics of nitrogen nutrition then governs that of assimilation, leaf proteins apparently playing a major role in the foliage expansion, survival, and assimilative activity.

Table 1 - Influence of typical treatments on Foliage duration and activity, net assimilation and production.

Treatments	N Kg.ha	pl.m <sup>-2</sup>	irrigation,mm	LAI	L.A.D. m <sup>2</sup> .D	Maturity, g.plant <sup>-1</sup>				Number	Aver. Mass	Eq. glucose
						begin. flow.	pl. <sup>-1</sup>	total glucose	T.D.M.			
0.9 m deep												
A	0	8.9	0	1.4	10	0.67	82	54a	14.6a	520a	28.1a	8.2
B	0	8.9	285	2.1	17	0.90	136	90b	23.1b	610a	37.9b	8.0
C	0+85	8.9	285	2.1	18	1.28	154	95b	33.6c	640a	52.6d	8.6
D	85+85	8.9	285	3.8	25	2.22	223	134c	50.3e	1180b	42.7bc	8.9
1.8 m deep												
E	170	8.9	0	2.6	20	1.69	172	103b	38.0cd	1060b	36.0b	8.6
F	170	8.9	285	3.8	26	2.37	239	148d	50.9e	1150b	44.3c	9.2
G	170	5.6	285	3.1	34	3.18	322	189e	74.6f	1770c	42.1bc	9.5

LAI = Leaf area index ; LAD = Leaf area duration, m<sup>2</sup>.days per plant.

a, b, c : significative differences, test DUNCAN probability 5 %

Table 2 - Influence of late nitrogen uptake due to fertilizing irrigation on the evolution of net assimilation ; B : irrigated ON ; C : fertilizing irrigation 85 N ; soil 0.9 m deep, without N fertilization at planting.

Successive stages	N Uptake, g.plant <sup>-1</sup>		N%D.M. of leaves		Eq. glucose, g.plant <sup>-1</sup>	
	B	C	B	C	B	C
Star	0.29	0.29	3.59	3.59	18	18
Beginning Flowering	0.63	0.76	2.25	2.81	73	67
Petals Fall	0.90	0.98	2.14	3.01	133	125
Maturity	0.90	1.28	0.74	0.86	136	154

Reference : PENNING de VRIES F.W.T., 1975 - In Photosynthesis and productivity in different environments. Cooper Ed., Cambridge Univ. Press, 459-461.