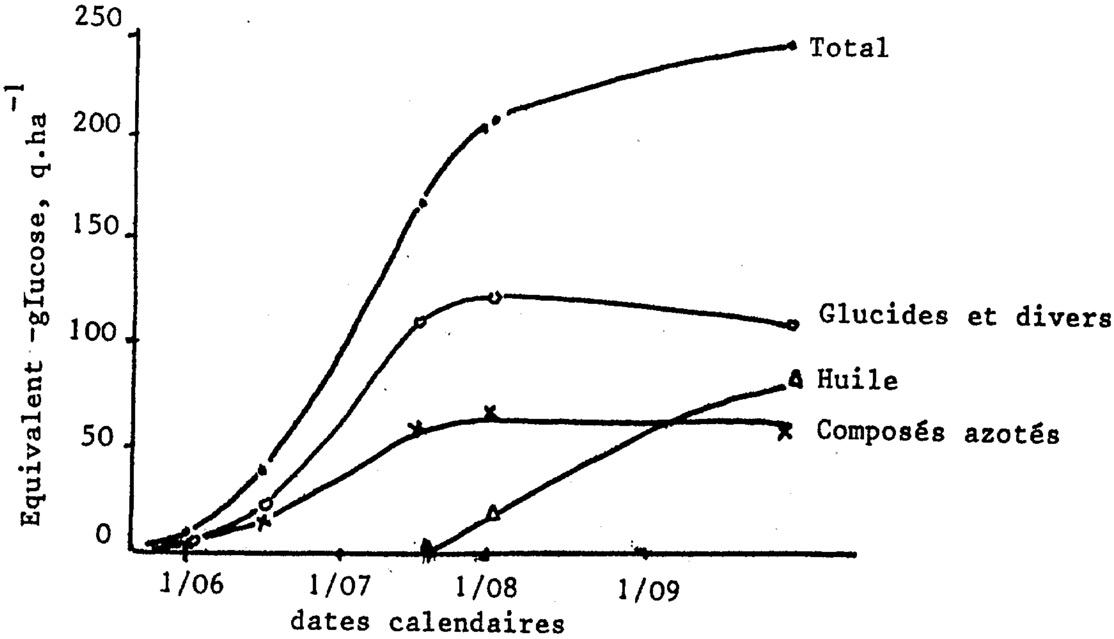
Figure 4. Répartition entre les principaux constituants de l'équivalent-glucose assimilé, en fonction du temps,chez le cv. Mirasol.



T1982AGR12

THE SUNFLOWER ROOTS ACTIVITY IN THE FIELD.

P. GONZALEZ-FERNANDEZ, F. CABALLERO-UNGRIA, R. MIRALLES de IMPERIAL and M. BIGERIEGO-MTIN. de SAAVEDRA.
I.N.I.A., Departments of Oil Crops and Physiology. Apartado 240, Cordoba, Spain.

ABSTRACT

In order to investigate the root activity of a sunflower crop in a very deep and heavy textured soil under non-irrigated conditions, phosphorus-32 (P-32) was placed at five different depths in the soil. The uptake of this isotope was measured during five growth stages. The climate in the preceding autumn and winter, as well as throughout the growth season, was drier that average, therefore, the results show the behaviour of the sunflower roots in that soil, under severe water limitation, mostly in the later growth stages.

After applying labelled phosphate and before the first sampling, the soil was harrowed between rows. At the first sampling date, maximum root activity was detected at 30 and 60 cm depth, but after a moderate rainfall (18.5 mm) which occurred a little later in the season, the activity at 10 cm depth was as high as at 30 amd 60 cm.

The yield, the dry matter produced, the percentage of phosphorus and the total phosphate content in all the aerial parts of the plants, were not significantly affected by additions of radioactive phosphate in the five depths, at any stage.

INTRODUCTION

The results obtained during the last four years of the sunflower fertilizer program in the south of Spain have very rarely shown a significant increase in the yield due to the added fertilizer (Gonzalez-Fernandez, 1981). These results can partially be explained by a traditional late broadcasting application of the fertilizer and/or the distribution pattern of the sunflower roots.

The rainfall in the sunflower growing areas in Spain is highly irregular and its distribution is typically Mediterranean, with wet autumn and winter, irregular spring and very dry summer. The sunflower has more than half of its vegetative period under very dry climatic conditions. Because of this when the sunflower needs more nutrients and water the richer superficial layers become drier. Then, the sunflower powerful root system, able to explore large volumes of soil and reach depths below 3.15 m (Berengena and Henderson, 1980), is impelled to absorb water from deeper layers less rich in nutrients. Therefore, the yield could be decreased due to the lack of nutrients, even where there is water available.

This experiment was initiated to investigate the depth and distribution of active roots of sunflowers and their variation during the growing period. The aim of the work was to devise an adequate fertilization system according to the climatic and soil conditions.

MATERIALS AND METHODS

The trial was carried out on the heavy textured cracking clay soil located on the "vega de Carmona", an area of homogenous and deep entic chromoxererts soils, (soil Taxonomy U.S.D.A.); some of its characteristics are in Table 1. The rainfall was recorded daily on the farm and the summarized data are shown in Table 2.

It is supposed that the P-32 additions in localized holes in the soil profile do not substantially modify the natural root system of the sunflower. In the first sampling of plants, 43 days after emergence the P-32 absorption at 30 and 60 cm was significantly higher than at other placements (Table 4). Seven days later there was a moderate rainfall of 18.5 mm, and in the second sampling 57 days after emergence the plants from plots with P-32 localized at 10 cm had a radioactivity as high as at 30 and 60 cm. It is believed that the reasons for this were that in the first sampling the absorption of P-32 at 10 cm depth was limited because the soil was harrowed four times (once before and three times after the treatment) and also because it became dry very soon. This data supports the idea that the sunflower at this stage has a very dynamic active root system, able to respond to variation in the water status of the soil. In the upland rice, Reyniers *et al.*, (1978) pointed out that there was a strong correlation between the P-32 uptake and the hydric potential in the soil. In the following samples (71, 85 and 100 days after emergence) the roots started to absorb P-32 from 90 cm in similar amounts to those taken up in the first 60 cm. In general, the more superficial placement (10 cm) was always more efficient and the deepest placement the least efficient.

Table 4. Uptake of P-32 by sunflower at different ages and depths.

Plant material	Depth cm.	43	57	71	85	100
		Days after emergence				
Heads	10		1461	1419	1104	1660
	30		2520	1190	899	994
	60		1562	484	828	1672
	90		1326	276	465	733
	120		1101	871	351	603
Leaves	10	444	1068	880	873	1239
	30	1593	730	639	808	921
	60	1270	1053	596	728	984
	90	81	126	308	487	745
	120	53	97	280	470	682
Stems	10		862	679	782	1294
	30		510	439	610	878
	60		453	397	764	800
	90		131	264	473	631
	120		87	221	492	544

Any two means not underscored by the same line are significantly different.

It is concluded that to improve the efficiency of the fertilizers in the sunflowers, when broadcasting, these must be ploughed or disked deep into the soil, if not localized near the seed. This is especially critical for the rather immobile nutrients such as phosphorus. For the most mobile nutrients earlier application could be advantageous.

LITERATURE CITED

BERENGENA, J. and D.W. HENDERSON. 1980 Extraccion de agua por las raices de un cultivo de girasol en secano. IX Conferencia Internacional del Girasol, Torremolinos, Spain. (In press).

GONZALEZ-FERNANDEZ, P. 1981. Data not published.

PAPADAKIS, REYNIERS, F.N., TRUONG, B., BOIS, J.F., BONNIN, E. and THOMIN, G. Characterisation de l'enracinement du riz pluvial in situ avec le phosphore-32. Proceedings of the International Symposium on the use of isotopes and radiation in research on soil-plant relationships. I.A.E.A. 1979: 635-647.

EFFECT OF DAYLENGTH ON THE TIME OF INFLORESCENCE INITIATION AND RATE OF POST-INITIATION DEVELOPMENT IN TWO EARLY SUNFLOWER CULTIVARS.

J. MARC[1], and J.H. PALMER[2]
1 School of Biological Sciences, University of Sydney, Sydney 2006, Australia.
2 School of Botany, University of New South Wales, Sydney 2033, Australia.

ABSTRACT

Early flowering cultivars Sunfola 68-2 and HA-124 were grown in controlled environments to assess their responses to long or short days. Three long-day regimes were examined; (A) 18 h high irradiance, (B) 18 h reduced irradiance, (C) 11 h high irradiance extended to 18 h by low intensity incandescent light. The one short-day regime comprised 11 h high irradiance, equivalent to the daily quantity of light supplied in (B) and (C). Apical buds were sampled at intervals to score the apex for the stage of flowering. Under the long-day regimes flower initiation occurred at about the same time, 18 to 21 days in Sunfola 68-2 and 20-22 days in HA-124. Initiation was delayed under short days, but only by about 2 days in each cultivar. By contrast, post-initiation development of the inflorescence was promoted by short days, accounting for the advancement of anthesis by 7 days in Sunfola 68-2 and by 10 days in HA-124. It is concluded that both cultivars are day-neutral for flower initiation and that photoperiodic effects apparently operate by influencing the rate of post-initiation development of the inflorescence.

INTRODUCTION

In the sunflower, photoperiodic studies have mainly been

It is supposed that the P-32 additions in localized holes in the soil profile do not substantially modify the natural root system of the sunflower. In the first sampling of plants, 43 days after emergence the P-32 absorption at 30 and 60 cm was significantly higher than at other placements (Table 4). Seven days later there was a moderate rainfall of 18.5 mm, and in the second sampling 57 days after emergence the plants from plots with P-32 localized at 10 cm had a radioactivity as high as at 30 and 60 cm. It is believed that the reasons for this were that in the first sampling the absorption of P-32 at 10 cm depth was limited because the soil was harrowed four times (once before and three times after the treatment) and also because it became dry very soon. This data supports the idea that the sunflower at this stage has a very dynamic active root system, able to respond to variation in the water status of the soil. In the upland rice, Reyniers *et al.*, (1978) pointed out that there was a strong correlation between the P-32 uptake and the hydric potential in the soil. In the following samples (71, 85 and 100 days after emergence) the roots started to absorb P-32 from 90 cm in similar amounts to those taken up in the first 60 cm. In general, the more superficial placement (10 cm) was always more efficient and the deepest placement the least efficient.

Table 4. Uptake of P-32 by sunflower at different ages and depths.

Plant material	Depth cm.	Days after emergence				
		43	57	71	85	100
Heads	10		1461	1419	1104	1660
	30		2520	1190	899	994
	60		1562	484	828	1672
	90		1326	276	465	733
	120		1101	871	351	603
Leaves	10	444	1068	880	873	1239
	30	1593	730	639	808	921
	60	1270	1053	596	728	984
	90	81	126	308	487	745
	120	53	97	280	470	682
Stems	10		862	679	782	1294
	30		510	439	610	878
	60		453	397	764	800
	90		131	264	473	631
	120		87	221	492	544

Any two means not underscored by the same line are significantly different.

It is concluded that to improve the efficiency of the fertilizers in the sunflowers, when broadcasting, these must be ploughed or disked deep into the soil, if not localized near the seed. This is especially critical for the rather immobile nutrients such as phosphorus. For the most mobile nutrients earlier application could be advantageous.

LITERATURE CITED

BERENGENA, J. and D.W. HENDERSON. 1980 Extraccion de agua por las raices de un cultivo de girasol en secano. IX Conferencia Internacional del Girasol, Torremolinos, Spain. (In press).

GONZALEZ-FERNANDEZ, P. 1981. Data not published.

PAPADAKIS, REYNIERS, F.N., TRUONG, B., BOIS, J.F., BONNIN, E. and THOMIN, G. Characterisation de l'enracinement du riz pluvial in situ avec le phosphore-32. Proceedings of the International Symposium on the use of isotopes and radiation in research on soil-plant relationships. I.A.E.A. 1979: 635-647.

T1982AGR13

EFFECT OF DAYLENGTH ON THE TIME OF INFLORESCENCE INITIATION AND RATE OF POST-INITIATION DEVELOPMENT IN TWO EARLY SUNFLOWER CULTIVARS.

J. MARC[1], and J.H. PALMER[2]
1 School of Biological Sciences, University of Sydney, Sydney 2006, Australia.
2 School of Botany, University of New South Wales, Sydney 2033, Australia.

ABSTRACT

Early flowering cultivars Sunfola 68-2 and HA-124 were grown in controlled environments to assess their responses to long or short days. Three long-day regimes were examined; (A) 18 h high irradiance, (B) 18 h reduced irradiance, (C) 11 h high irradiance extended to 18 h by low intensity incandescent light. The one short-day regime comprised 11 h high irradiance, equivalent to the daily quantity of light supplied in (B) and (C). Apical buds were sampled at intervals to score the apex for the stage of flowering. Under the long-day regimes flower initiation occurred at about the same time, 18 to 21 days in Sunfola 68-2 and 20-22 days in HA-124. Initiation was delayed under short days, but only by about 2 days in each cultivar. By contrast, post-initiation development of the inflorescence was promoted by short days, accounting for the advancement of anthesis by 7 days in Sunfola 68-2 and by 10 days in HA-124. It is concluded that both cultivars are day-neutral for flower initiation and that photoperiodic effects apparently operate by influencing the rate of post-initiation development of the inflorescence.

INTRODUCTION

In the sunflower, photoperiodic studies have mainly been