porate high harvest indices into such high yielding dryland sunflowers as Seneca. However, as our data have demonstrated that harvest index and yield are not necessarily linked, it is essential to quantify both in any breeding programme.

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DETERMINATION OF PHYSIOLOGICAL AND HARVEST MATURITY IN SUNFLOWER.

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ABSTRACT

The time duration of two ontegenic periods was studied in several cultivars of sunflower. They were: the time from flowering to physiological maturity and the time from physiological maturity to harvest maturity. Grain weight, viability, oil and moisture content were measured weekly. The results show that physiological maturity was reached in all the cases 36 — 40 days after anthesis. The time from physiological maturity to harvest maturity was very variable ranging from 11 to 30 days. In both cases all variations were mainly due to climatic conditions without influence of the genotypic characteristics.

INTRODUCTION

Specifically for the sunflower crop, Anderson (1975) and subsequent works, consider physiological maturity as the time when the fruits of a head reach the maximum percentage of viability, oil content and dry weight.

This information if useful when it is necessary to predict the time of harvest of the sunflower crop.

Anderson (1975) determined that physiology maturity in sunflower is attained when cypsellae have a moisture content less than 40%, while Browne (1978) related the time at which the physiological maturity is attained to the natural fall of the floral vestiges.

Robertson (1978) determined that the maximum seed dry weight and the maximum oil content are attained 35 days after the beginning of flowering, and when the seed moisture content is 36%.

Ortegon Morales (1980) stated that physiological maturity was reached 25 days after the end of flowering in a trial conducted in Mexico.

MATERIALS AND METHODS

The trials were conducted at the Regional Agricultural Experimental Station, INTA, Balcarce. During the 1978/79 season, the determinations were done on two plots of the cultivar Continental P-75; in 1979/80 on a plot of the cultivar Continental P-75 and another on the cultivar Contiflor, and the last of the 1980/81 season was obtained on the cultivar Super-500. To do this, plants that flowered simultaneously were marked, considering that the flowering days was that on which the highest percentage of heads flowered, and discarding all the heads that had not yet flowered or that had begun to flower on previous days.

Ten heads were sampled every week till the natural drying of the plants. Of the seed obtained, 100 were dried in an oven with air circulation at 30°C, to determine viability. The rest of the seeds were weighed and dried in an oven with air circulation at 70°C, to determine the moisture content. Oil percentage was determined by the nuclear magnetic resonance method.

Germination percentage was determined in Petri dishes in an oven at 23°C, once the seeds had passed their dormant period.

The development of dry weight was studied by obtaining the weight of 1000 seeds of each head. In order to be able to relate the time in which the physiological maturity is attained with some morphological characteristics of the plant easily seen, color photographs of the plant were taken the day the samples were taken.

RESULTS AND DISCUSSION

The development of dry weight of 1000 seeds for the three cultivars used is shown in Table 1. In the 5 cases analysed, the maximum weight of 1000 seeds occurred between 36 and 40 days after flowering.

Table 1. One thousand seed weight, oil content, seed viability, moisture content and days between physiological and harvest maturity on 3 cultivars grown during 3 seasons from 1978 to 1981.

Cultivar	Year	Days Since Flowering: Maximum weight of 1000 dry Seeds	Maximum oil content	Maximum seed viability	Moisture Content (%) After Fulfilling The 3 Requirements	Days Between physiological and Harvest Maturity
P-75 Plot No. 1	1978/79	36	33	32	38	12
P-75 Plot No. 2	1978/79	36	33	—	33	11
P-75	1979/80	37	36	37	41	11
Contiflor	1979/80	38	29	33	36	8
Super-500	1980/81	40	—	40	38	30

The development of oil content is shown in figure 1. This content was maximum between 29 and 36 days after flowering and in every case before the maximum seed weight was reached.

The evolution of percentage of germination for every 100 seeds of the extracted samples are shown in Figure 1. It can be seen that the maximum value of viability was attained between 32 and 40 days after flowering (see also Table 1).

Of the three requirements considered by Anderson (1975) for physiological maturity in sunflower, the one that occurs last in our trials was maximum seed dry weight.

This requirement was fulfilled in the 5 trials that were carried out, between 36 and 40 days from the beginning of flowering (Figure 1 and Table 1).

The cypsella moisture content at the time of physiological maturity varied between 33% and 41%, (Figure 2 and Table 1).

Figure 1. Estimated development of viability and oil content taken extreme examples.

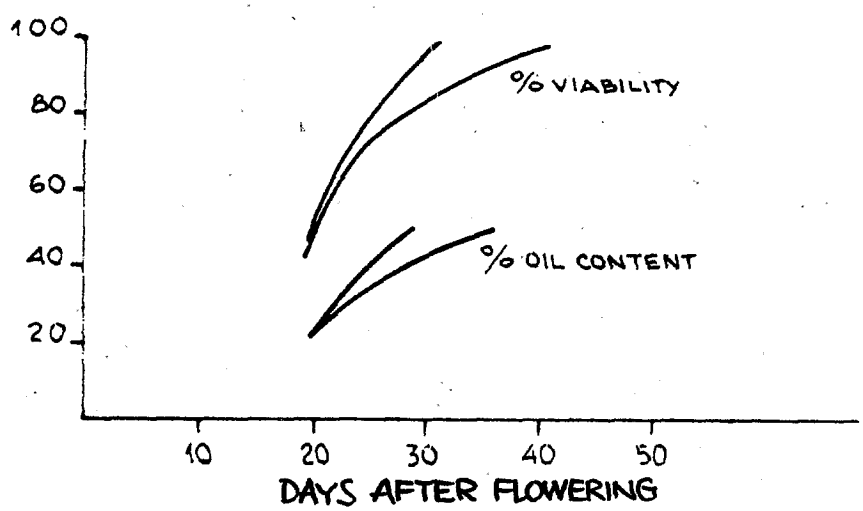
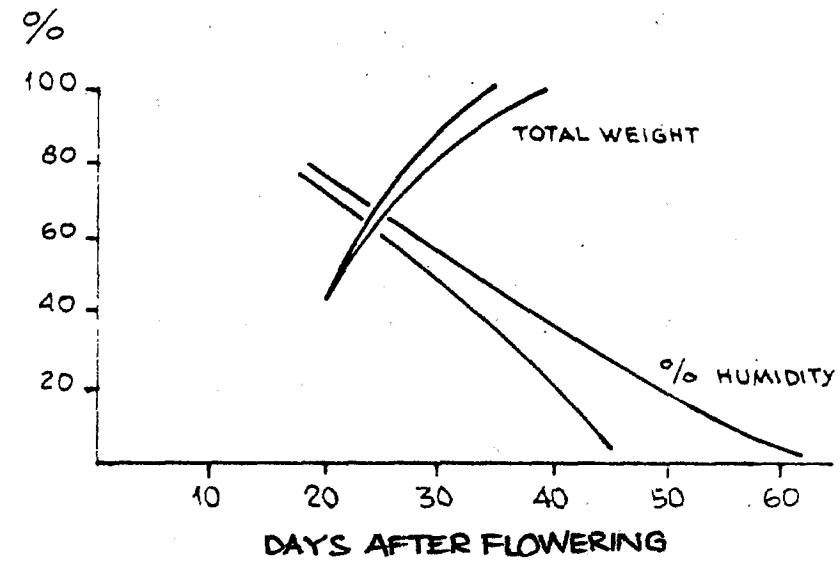


Figure 2. Estimated development of dry weight and moisture content of cypsellas.



Observations of head characteristics before and after physiological maturity, did not show any clear relationship between head colour and stage of development. The other indicator of physiological maturity was the generalized fall of the floral vestiges of the fruits, a characteristic that was first mentioned by Browne (1978).

The duration of the period between flowering and physiological maturity was little influenced by environmental conditions and there were no important differences between cultivars.

On the basis of this information it can be concluded that it is possible to forecast that the physiological maturity will occur approximately between 35 and 40 days after the generalized opening of the heads, adjusting then the time with greater precision by the signs of the beginning of the bract drying and the natural fall of the floral vestiges.

The number of days between physiological and commercial maturity varied between 8 and 30, the shortest period corresponding to one of temperatures higher than normal and the longest period corresponding to one with low temperatures and higher relative humidity.

Colabelli (1981), analysing the period from flowering to commercial maturity, found important differences among sowing times and among years, but no differences among cultivars of different maturity type. It can be thought, therefore, that if according to our information and to the available literature the period flowering-physiological maturity is not very elastic, the variations found must correspond to the period physiological-commercial maturity. The environmental conditions are the determinant factors of the duration of the period of loss of moisture or senescence, there being no important differences among cultivars.

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EFFECT OF PHYSIOLOGICAL MATURATION ON QUANTITATIVE CHARACTERS OF SUNFLOWER VARIETIES AND HYBRIDS.

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ABSTRACT

The following physical and physiological characters of seed of sunflower hybrids and their parent lines were examined: 1000 seed weight, hectoliter weight, and husk percentage; germination energy and germability. The study, which included five hybrids, three cms lines, four restorers, and VNIIMK 8931 as the control, was conducted for three years in one locality.

Ten days after pollination, germination energy in VNIIMK 8931 ranged from 0 to 3.75% while the germability was 19.75%. The minimum 1000 seed weight was 13.9 gr (NS-H-25-RM), the maximum 30.4 gr (NS-H-28-RM). The minimum husk percentage was 42.7% (NS-H-63-RM), the maximum 76.6% (NS-H-25-RM). The minimum hectoliter weight was 15.05 kg (NS-H-25-RM), the maximum 24.46 kg (RHA-58).

Fifty days after pollination, the minimum germination energy was 81.75% (RHA-59), the maximum 99.25% (NS-H-63-RM). The highest germability was found in NS-H-63-RM : 99.25%. The minimum 1000 seed weight was 23.0 gr (RHA-58), the maximum 78.7 gr (NS-H-28-RM). The minimum husk percentage was 19.0% (NS-H-27-RM), the maximum 28.2% (RHA-58). The minimum hectoliter weight was 34.15 kg (RHA-18), the maximum 46.20 kg (cms-9).

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