Effects of the sowing date on the apical meristem of *Brassica napus* L. during transition to flowering.

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Interest in rapeseed as a crop for farms in central Italy has increased rapidly over the last years. Winter-sown varieties (Table 1) have been mainly used for their higher seed yields and higher oil content, but it is necessary to know the best Autumn sowing date for our environment characterized by a sub-mediterranean mountain climate.

The influence of the period of vernalization, the morphological changes in the apical meristem during transition to flowering and the total number of winter rapeseed leaves in cv. Rafal of *Brassica napus* L. var. *oleifera* were studied in the farm of the Agricultural Faculty at the University of Perugia (central Italy).

Material and methods

The dates of sowing were as follows: Experiment 1 - September 1; Experiment 2 - September 15; Experiment 3 - September 30; Experiment 4 - October 15; Experiment 5 - October 30.

Ten apices of plants from each experiment were collected weekly and fixed in FAA and processed by standard paraffin techniques. Eight-µm thick sections were stained with safranin and fast green for analysis of cytohistological zonation and with azure B for the determination of cytohistochemical zonation.

The width and heigth of the meristem were measured and inside the meristem the different zones were delineated on the basis of their histological characters (affinity for stains, cell size). The number of cells and the median longitudinal sectional area for whole meristem and different meristematic zones were measured on photographs of meristem at high magnification.

At the harvest the yield and components of yield were determined in each experiment. All values are the mean of five replications.

Results and discussion

A biseriate tunica and subjacent corpus were seen in the vegetative stage. Some changes in the morphological and histological characters in the apical meristem during transition to flowering were observed (Figs. 1, 2). During the vegetative growth the apical meristem increased from 40 to 95-115 µm. During the same period apical width increased from 150-200 µm to 260-320 µm.

An increase in the number of cells was observed in this period especially in

the peripheral meristem and in the central meristem. Also the area of these zones increased. A net decline in shoot apical meristem height occurred after its value was 95-115 μm. We can take this decline as the start of floral stage.

In Experiments 1, 2 and 3 the floral stage began during the first week of December when the plants had 7 to 8, 6 to 7 and 5 to 6 developed leaves respectively. In Experiment 4 the reproductive stage was initiated on the 60th day after the cotiledonary stage, at the end of December, when the plants had 3 to 5 developed leaves; while in Experiment 5 the plants still were not vernalized at the end of January when only 3 or 4 leaves had developed therefore bud initiation was delayed.

Analysis of yield components (Table 2) shows significant differences only in the Experiment 5 above all due to high mortality during the winter. Figure 3 shows the climatic diagram for the station where the experimets were carried out.

We can conclude that the plant must have developed at least three to five leaves to be vernalized and to resist the cold. At this stage of development the plants need a longer period of vernalization in comparison with plants which have a greater number of leaves. However this stage is sufficient to ensure normal floral induction. In the climatic conditions of central Italy, where the average temperature drops below 10-12 °C in the first half of November and drops to the minimum temperature (3-4 °C) in February, sowing should take place not after the 15th October.

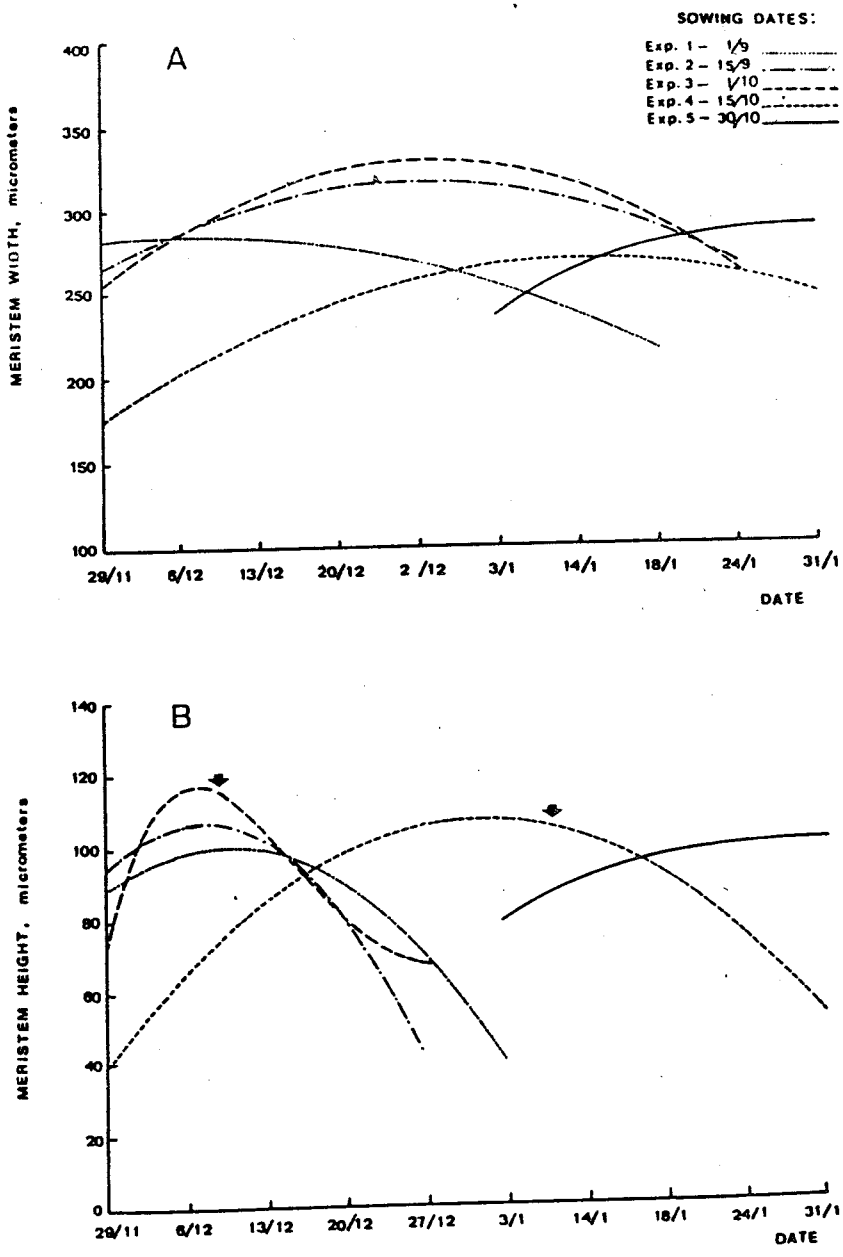

Fig. 1 - Meristem width (A) and height (B) at various times after sowing; the arrows show the start of floral stage.

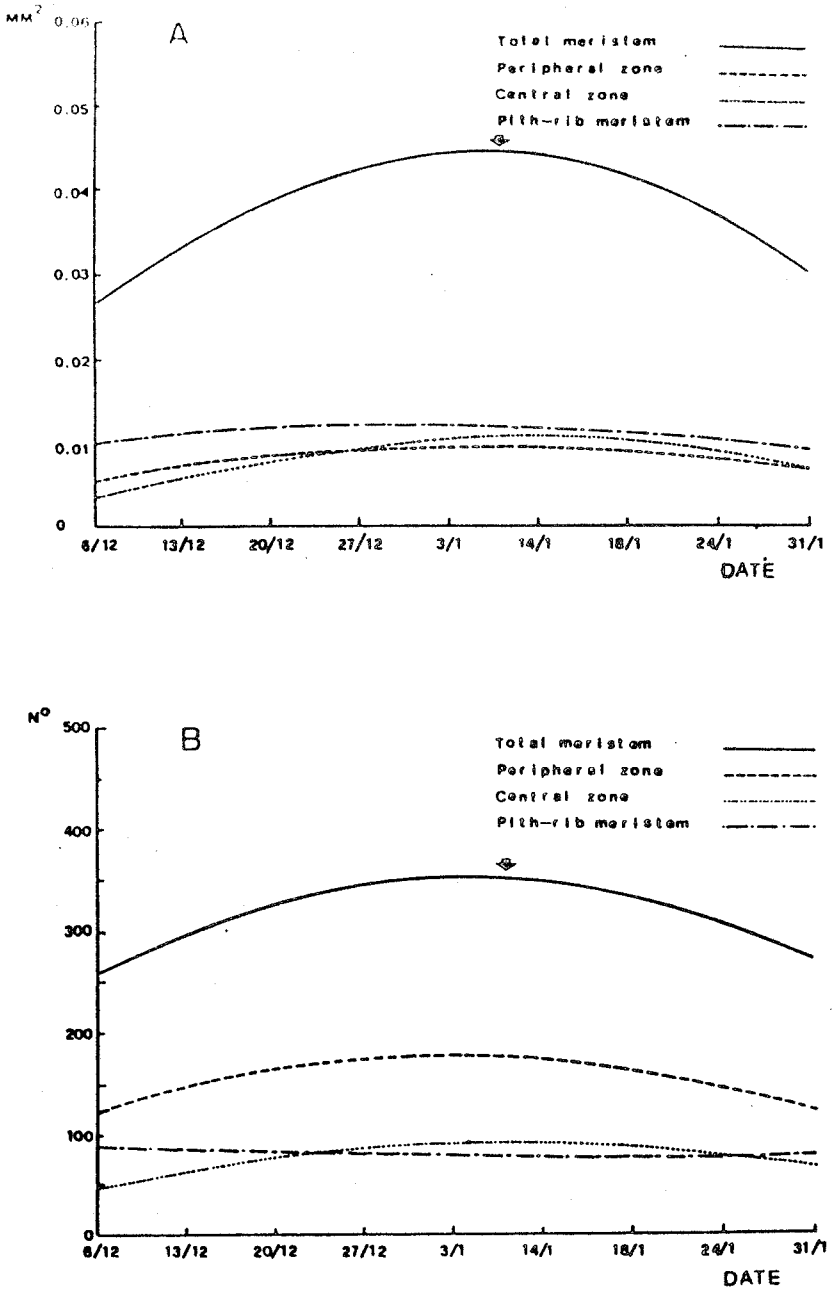

Fig. 2 - Area (A) and Number of cells (B) of whole meristem and different meristematic zones in median longitudinal section at various times after the sowing in Experiment 4; the arrows show the start of floral stage.

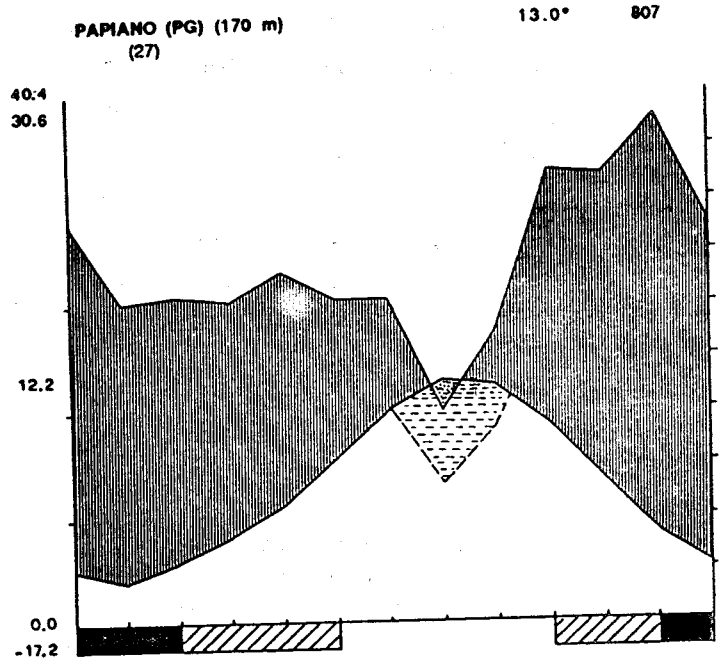

Fig. 3 - Climatic diagram for the station where the experiments were carried out.

TABLE 1 - Some parameters of main cultivars of *Brassica napus* L. cultivated in central Italy. (The values are the mean of four years: 1982-85)

CULTIVARS	Grain Yield ($t.ha^{-1}$ D.M.)	Plant Height (cm)	Seed Weight (mg)	Flowering Beginning (day-month)	Lodging (%) (1)
RAFAL	4.00	130	4.16	21-4	5
BIENVENU	3.94	138	3.45	21-4	24
JET NEUF	3.85	134	4.35	24-4	55
LINGOT	3.73	121	3.36	21-4	5
QUINTA	3.63	154	4.11	26-4	60
GUNDULA	3.66	144	3.99	22-4	25
BELINDA	3.58	147	4.09	27-4	50
TAMARA	3.57	154	4.08	24-4	90
KORINA	3.55	148	4.09	27-4	70
ELVIRA	3.52	148	4.01	27-4	100

(1) year 1984 only

TABLE 2 - Components of yield in *Brassica napus* L. cv. Rafal.

SOWING DATES	COMPONENTS OF YIELD			
	No. of pods/plant	No. of seeds/pod	Seed weight (mg)	No. of plants/m^2 at final harvest
Experiment 1 - 1st Sep.	96.1	16.3	4.4	90
Experiment 2 - 15th Sep.	96.3	17.6	3.8	87
Experiment 3 - 1st Oct.	101.4	20.2	3.8	92
Experiment 4 - 15th Oct.	84.9	21.7	3.9	80
Experiment 5 - 30th Oct.	70.0	15.5	3.5	35
M.S. p = 0.05	45.6	5.3	0.9	15
p = 0.01	83.8	9.9	1.6	20