Monitoring of a network fields producing winter oilseed rape in central France.

Merrien, A., Charbonnaud J., Reau R.
CETIOM 270 avenue de la Pomme de Pin 45160 Ardon – France, merrien@cetiom.fr

Abstract

A network of about 60 fields producing oilseed rape was monitored for 7 years. The following factors were studied : varieties, plant density, planting process and plant settlement. We check also the amount of nitrogen absorbed by winter's end, the main growth stages, the yield components (i.e : number of pods as well as number of seed and thousand seed weight). Yield was also recorded. After the harvest, a sample was taken to determine the level of impurities as well as the water content. This kind of network has contributed significantly to the annual evaluation of rapeseed production and has provided an inter-annual approach to variability. Up to now, 1997 has been the best year according to our criteria.
The availability in real time of the data through the web, as the rapeseed cycle developed, has also served as a forecasting tool : help to N-fertilizer practices at spring, value of the photo-thermal ratio during flowering used as an indicator of seed-set. As far as the yield is concerned, the number of pod produced at the beginning of the ripening period is also available one month before harvest and use as a predicting tool of the yield.

Keywords : Rapeseed – yield components

Introduction

In order to obtain an annual evaluation of rapeseed production in the Centre of France, a network is monitoring for 7 years now covering 90 fields. Most of the criteria dealing with crop growth and yield elaboration are checked each year. Such results could be used as forecasting tools (for nitrogen application at spring for example). They are also available to understand and explain year by year the yield fluctuations, including the climatic effect, mainly appreciate by the photo-thermal ratio.

Materials and methods

The following factors were studied : varieties, plant density, planting process and plant settlement. We check also the amount of nitrogen absorbed by winter's end, the main growth stages, the yield components (i.e : number of pods as well as number of seed and thousand seed weight). The pods number had been counted. Yield was also recorded at harvest.

Results

Sowing date : Over the 6 years of the investigation it's notable that the percentage of crop sown before the first of September increase (figure 1). Up to now, more that 90 % of the rapeseed crops are sown before this threshold. This practice allows not only a better root esta-

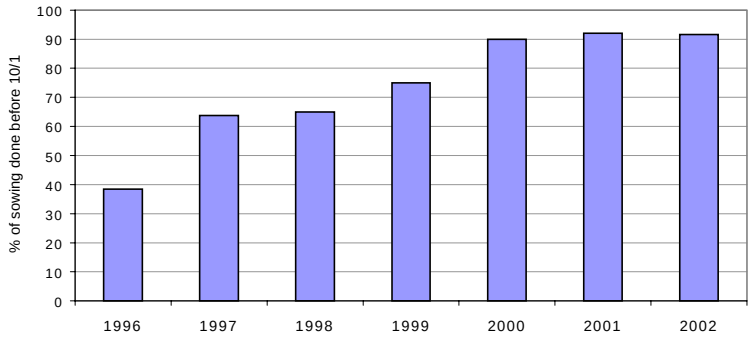

Figure 1: Evolution of the sowing date (frequency before 10/1) during last 7 years

-blishment before winter, but also an increase of the green cover of the soil during autumn leading to increase nitrogen absorption (from residues or mineralization).

Nitrogen absorption : By checking the green weight of the aerial biomass, we calculate the nitrogen mobilisation by the cover at the end of winter. The figure 2 illustrated the behaviour of the 2 last years compare to 96-97.

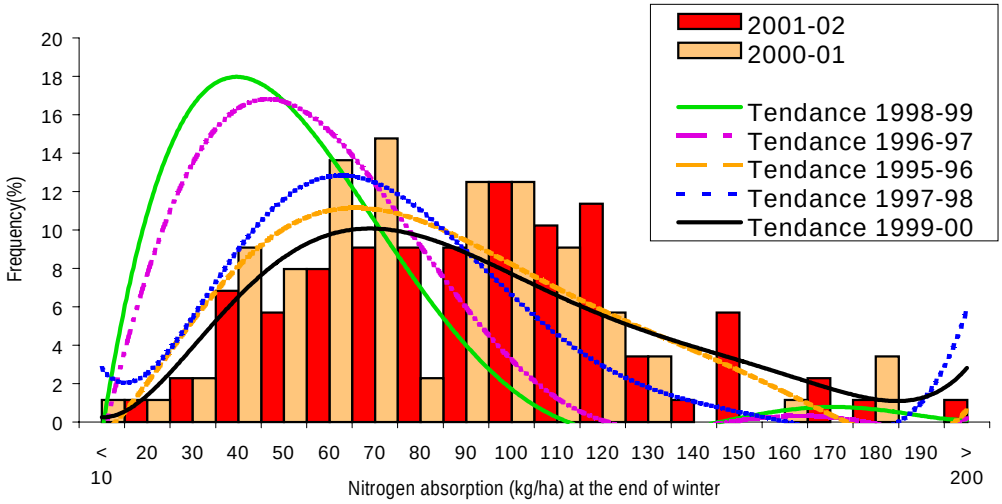

Figure 2 : Frequency of the nitrogen absorption at the end of winter.

In 2000 and 2001, rapeseed was able to absorb around 70 to 80 kg of nitrogen per sqm. This absorption could be subtracted from the whole requirements of the crop, according to yield objectives. For 7 years now, we identified that up to 40 kg N absorption during winter, the potential yield at spring was not affected. This demonstrated also that under our conditions, by an early sowing, there is no interest for N application before winter. The plants are able to provide their requirements from N residues in the soil.

Yield components : The table included here summarized the pluri-annual data obtained from the best ten field versus the ten worst from 1996 to 2002 harvest. The data had been controlled on plots in each field. Number of pods per sqm varies from less than 5000 up to 8800 for the best plots.

Year	Pods / sqm	Seeds /sqm	1000 seed weight (g)	Yield (q/ha)	Seeds per pod	Photo thermal ratio
2002 (I)	**7 243**	**94 268**	**4.44**	**41.6**	**13**	**1.5**
2002 (2)	**7 234**	**57 168**	**3.86**	**21.8**	**6.9**	
2001	8 840	70 519	5.21	36.5	9.2	1.3
2001	5 698	30 718	5.04	14.6	6.9	
2000	8 188	82 200	4.9	40.1	11.6	1.2
2000	6 670	49 403	4.5	22.1	7.9	
1999	7 855	89 800	50	44.5	13	1.3
1999	5 861	60 349	4.4	26	10	
1998	7800	84 000	5.2	43.5	11	1.3
1998	4900	67 500	4.6	31	14	
1997	7900	107 000	5	50	14	1.9
1997	4800	71 000	4.3	30	15	
1996	6700	97 000	4.5	44	15	1.4
1996	6800	63 000	4.4	28	9	

(1) Average for the ten best plot (2) Average for the 10 worst plots

Table 1 : Yields components for oilseed rape grown in Centre of France over 7 years.

The record year (1997) allows to set up optimal value for yield components : more than 7500 pods per sqm are requested to reach more than 100 000 seeds per sqm. The thousand seed

weight could be affected by the genotype. Nevertheless, by reaching values closed to 5 g, an average yield of more than 5t/ha had been observed in 1997. This could be related to the climatic conditions during seed set : the ratio between radiation (i.e the carbon source) divided by temperature (i.e the flowering rate, according to 3°c per flower).

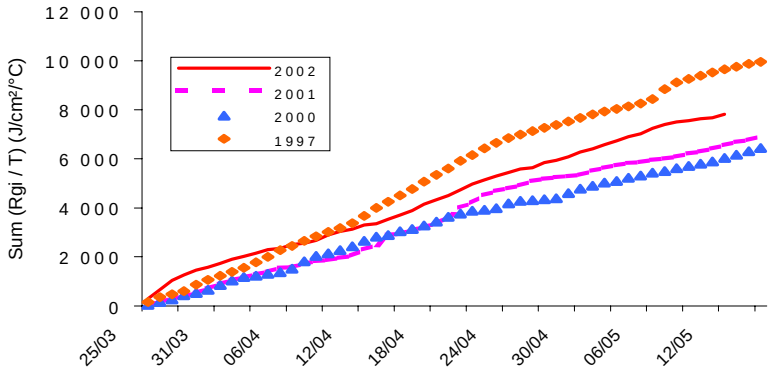

Figure 4 : Photo-thermal ratio during flowering period (Centre of France – Department of Cher)

The best value for the ratio was obtain during flowering in 1997. Last year (harvest July 2002) the climatic potential was also very good : more than 7000 pods was controlled over 90 fields plots. The 10 best one 's produced close to 95 000 seeds per sqm. Unfortunately, the seed filling period was affected by water stress, high temperatures and sometimes, *phoma lingam*. According to that, around 0.5t/ha was lost due to bad seed filling, as illustrated in the figure 4.

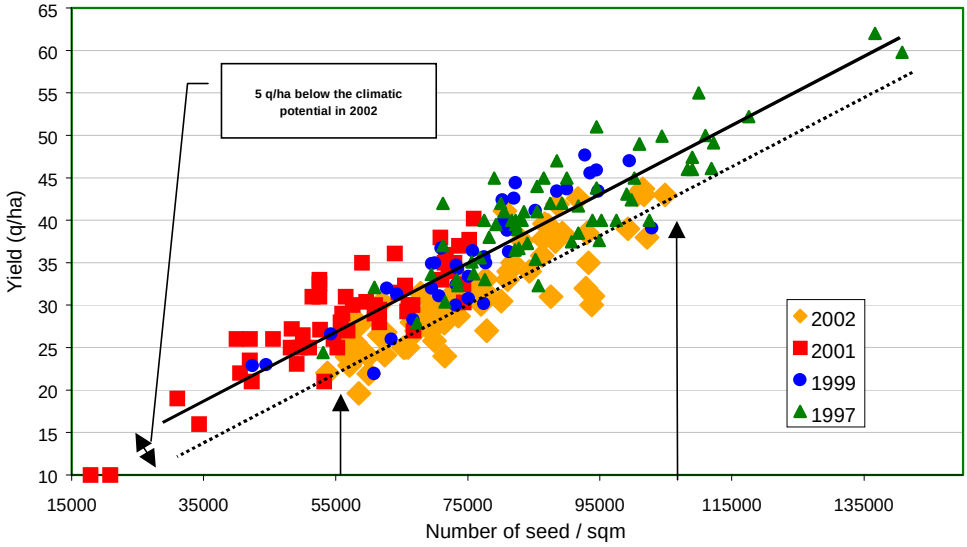

Figure 4 : Relation between the number of seeds /sqm and yield.

Discussion

Such a network has also made it possible to specify threshold values for growth and development of oilseed rape in France since it demonstrates the genetic potential of present varieties : a minimum of 40 kg of N to absorbed at the onset of winter, 7500 pods and more than 80 000 seeds per square meter are also requested for maximizing the yield potential of the actual varieties. The flowering period appears to be a critical stage for seed set : high value for the photo-thermal ratio could be obtained by high radiation incidence and by a low flowering rate, allowing a success for flower to pod and for seed set. Nevertheless, diseases or water shortages during the ripening period could affected significantly the 1000-seed weight and reduce yield.