AgroLife Scientific Journal - Volume 3, Number 2, 2014
ISSN 2285-5718; ISSN CD-ROM 2285-5726; ISSN ONLINE 2286-0126; ISSN-L 2285-5718

INFLUENCE OF SOWING TIME ON THE EXPRESSION OF BARLEY AND WHEAT PLANTS PHYSIOLOGY

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Abstract

Tipically, in our autumn wheat and barley have sown in a relatively wide range, due to variuos causes: climate (Slater, 1976), management etc. To clarify what would be the most appropriate range for the plants to know the physiology of the most favorable, decadal have experienced many moments of sowing several years. Period was thus between Sept. 10 and Nov. 1 (6 points sowing). Plants were studied by several indices for physiology expression (Stoy, 1969) i.e. leaf area index (LAI), the photosynthetic potential by leaf area duration (LAD), net assimilation rate (NAR) and grain yield. Among these features were found match, but on the contrary, some are even contradictory. Thus, if the maximum LAI of wheat was obtained from Oct. 1 (9.2 m^2 leaf/m^2 soil), the maximum photosynthetic potential was still to Oct. 1 (1.48 km^2 leaf x day), and maximum net assimilation rate was obtained in Oct. 10 (6.63 g d.m./m^2/day). LAI of barley was Oct. 1 (7.4 m^2 leaf/m^2 soil), maximum LAD Sep. 20 (1.11 km^2 leaf x day), and maximum NAR Oct. 10 (7.05 g d.m./m^2/day). In these conditions, the maximum grain production was formed for wheat in Oct. 1 with an extension until Oct. 20. Winter barley was maximum in Oct. 1 with an extension from Sept. 20 until Oct. 10.

Keywords*: wheat, barley, LAI, LAD, NAR, grain yields.*

INTRODUCTION

For better success of the crop of both plants is recommended that sowing their appropriate times to do specific, in the autumn (Bîlteanu et Bîrnaure, 1989). In practice it was found (Quisemberry et Reitz, 1967) that its performance takes place in a fairly wide range, starting in Sep., continuing to Oct. and sometimes in Nov. Certainly sown plants, or too early, or too late, phsiology adapts to these conditions (Sebillotte, 1980), demonstrating, not infrequently, some deviation from their normal state.

By sowing the two plants, as well as other autumn crops, not intended other than as placement of their good time (Ceapoiu et al, 1984; Drăghici et al., 1975), so that development of vegetation to take place at the highest possible value. Increased production will be achieved only if the plants are grown and developed as well, that show a large enough habitus (Şipoş et al., 1981). In its construction has an important role assimilation surface of leaves, and other bodies with green, stem and ear. From the research it was found that the maximum leaf area obtained in optimal time, most often leads to the formation of higher yields. Yet, what happens when the two plants are placed while the less favorable moments? The experiments carriet out under various conditions have shown adaptation which have been generally characterized as decreased physiological activity due to formation of reduced production.

Of all the physiological aspects that demonstrate the influence of sowing time on wheat and barley plants (Tianu et Bude, 1985), some are more obvious, relatively easily measured and could give a comprehensive response to the formation of grain production. Total biomass and the grain is based on net assimilation of all surfaces of plants per unit area. One measure currently used is the *leaf area index* (LAI), or short leaf index (LI). It characterizes the relationship between leaf area (LA) which is formed on a surface of the crop and the surface of the land. An index of 3.3 means that on 1 m^2 of crop, leaf area amounts to 3.3 m^2 leaf. LAI characterize the culture at a

particular time. LAI is attained during two flowering plants. The literature has demonstrated the LAI values between 2 and 8-10. But to characterize the timing of the capture radiant solar energy (Tashiko, 1962; Zamfirescu, 1977), it shall record the dynamic evolution of LAI and adding them throughout the growing season. All LAI who worked during the vegetation period is measured in km^2/day and is called the *photosynthetic potential*, PP, or LAD- leaf area duration. LAD is based on periodic measurements of LAI. Thus, LA plot developments throughout the growing season by interpolating the values obtained in short intervals of 1-3 days. LAD resulting from adding daily values throughout the growing season. Wheat and barley normal LAD is between 1 and 2 km^2 x day. Resultant of photosynthetic activity, at a time and by the and of the vegetation period is expressed by *net assimilation rate*, NAR. It a measure of the ability of photosysnthesis and dry matter production expressed per unit area, per unit of time. The values obtained represent the grams of dry matter per m^2 of leaf per day (g d.m./m^2/day). Between LAI, NAR and grain yield are looking for the best relationship, so that the practical expression of plant physiology lead towards achieving yields increasingly higher.

MATERIALS AND METHODS

In order to fit the widest period of sowing area (Milthorpe et Ivins, 1966), it proceeded to establish the decadal by 6 points during Sep. 10 - Nov. 1. Wheat and barley was cultivated by the technology developed by the resort normally using a relatively long period of time, adapted varieties for highlands plains of Piteşti. Data represent the mean periods of research. The measurements and determinations were made both in the field and in the laboratory, following the three parameters.

Leaf area index, LAI, was determined by measuring the leaf lamina from the main stem, using the dimensions of limb length and width of its widest part. The calculation was using the formula: LAI = L x l x correction factor. Correction coefficient can take values between 0.67 and 0.75, depending on the author. The calculations have used the factor 0.67. Values obtained from a plant were summed and were multiplied with the number of plants per m^2 (density determined from sunrise until spring to avoid inconsistencies appear). Plants were scored for measuring one meter by one in four repetitions.

Photosynthetic potential, LAD, was determined by drawing diagrams LAI developments until the plants did not have green leaves (surfaces). To obtain diagrams proceeded to measure LAI in a very short period of 1-3 days. The curves have been extrapolated evolution of LAI obtaining graphs were drawn on the sheet millimeter. On this basis proceeded to adding daily values and became the expression LAD like km^2 leaf x day.

Photo 1. Winter wheat with maximum LAI

Net assimilation rate, NAR, was determined during the growing season and at the end. The paper presents NAR entire growing season. To obtain values proceeded to harvest mature plants and weighing biomass formed (as dry-d.m.). NAR values were obtained reporting grams/LAI/day of the entire vegetation periods.

Grain yield, GY, was obtained by harvesting the crop of 10 m^2, in each variant, the four replications. In the expression results were used as statistical calculations, like Anova test (analysis of variance) and Excel.

RESULTS AND DISCUSSIONS

Expression LAI of wheat and barley at different times of sowing. Since the spring to maturity were performed measurements and determinations. The presentation includes data from two periods: a period considered early: Sep. 10 - Oct. 1, and one considered late: Oct. 10 - Nov. 1. For the first time, wheat, their evolution has shown relatively steady grown in the period to bloom and abrubte after flowering

(Figure 1), while barley evolution was slow to start and quick to bloom. Maximum LAI ranged from 7.6 as on Sep. 10, 9.2 on Sep. 20 and 8.4 on Oct. 1. For wheat, and between 6.6 and 5.2, 7.4 respectively for barley. For the latter has been found during the different reactions of plants. Firstly decreased maximum LAI values and operating rate was relatively constant leaf for wheat and irregular for barley (Figure 2).

The graphs show that by delaying sowing, barley plants suffer more compared to wheat. Maximum LAI varied between 6.7, 4.5 and 2.9 respectively. Maximum LAI of barley decreased from 7.1 to 3.7 and finally to 1.7 m^2 leaf/m^2 of crop (land).

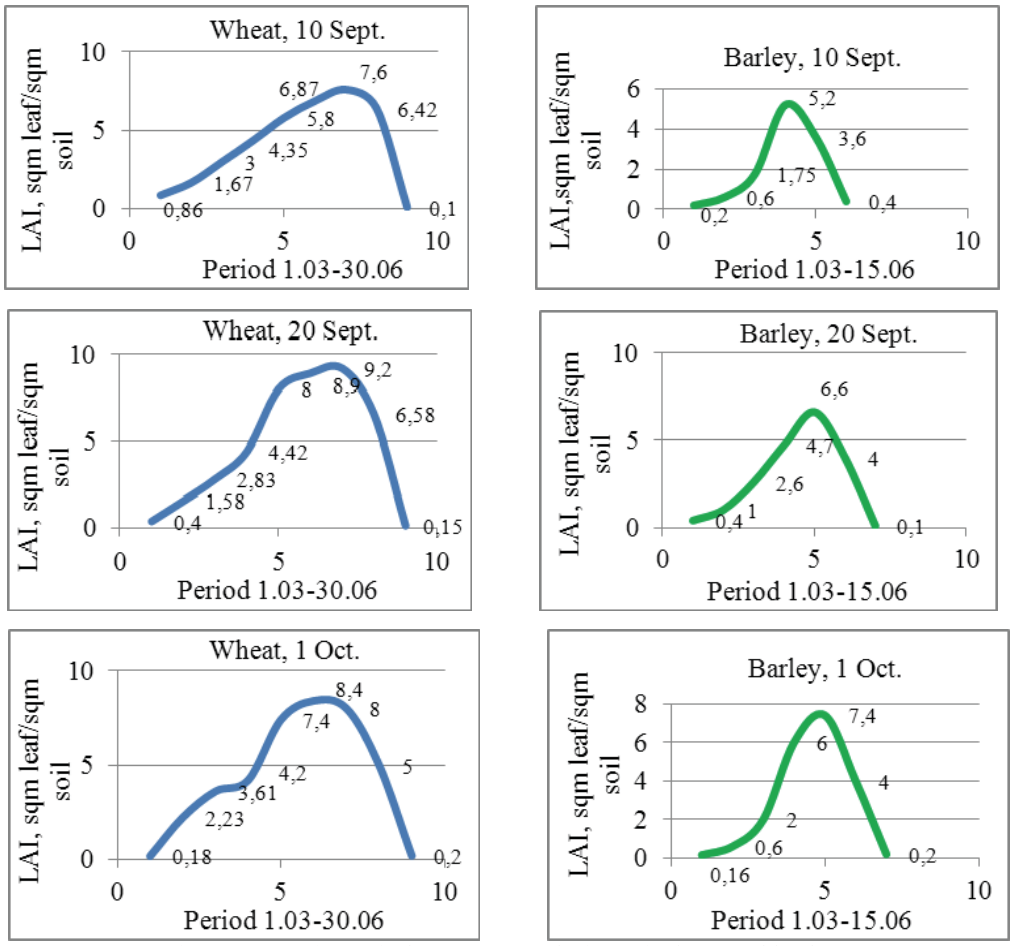
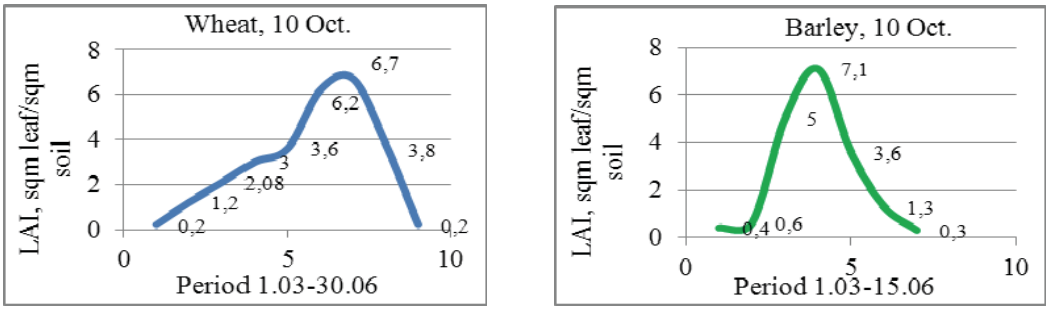


Figure 1. Leaf area index (LAI) evolution of wheat and barley for the early period: 10 Sep. - 1 Oct.

The evolution of photosynthetic potential, LAD. Depending on the time of sowing, the plant photosynthetic potential expressed at specific levels. The highest values were obtained as wheat and barley, both sown in Sep. 20., with 1.48 and respectively 1.11 km^2/day (Figure 3).

Of course the two graphs show different trends. Wheat higher values were obtained in Sep., followed by a decrease in late sowing. For barley, LAI values were relatively constant during the period Sep. 20 - Oct. 10, after which greatly decreases.



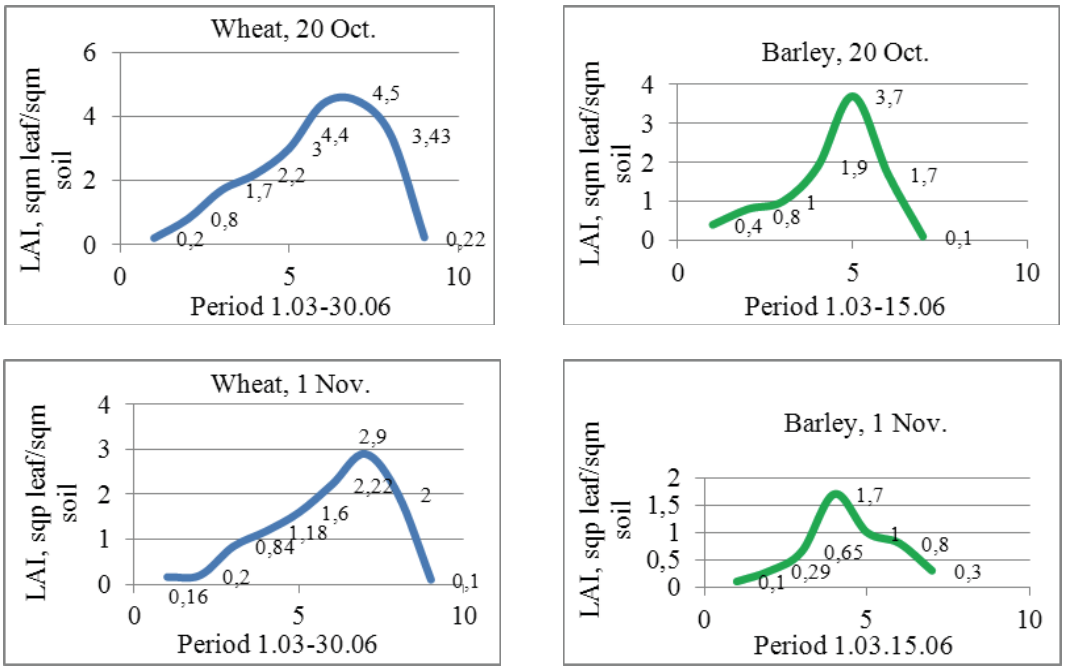


Figure 2. Leaf area index (LAI) evolution of wheat and barley for the late period: 10 Oct.-1 Nov.

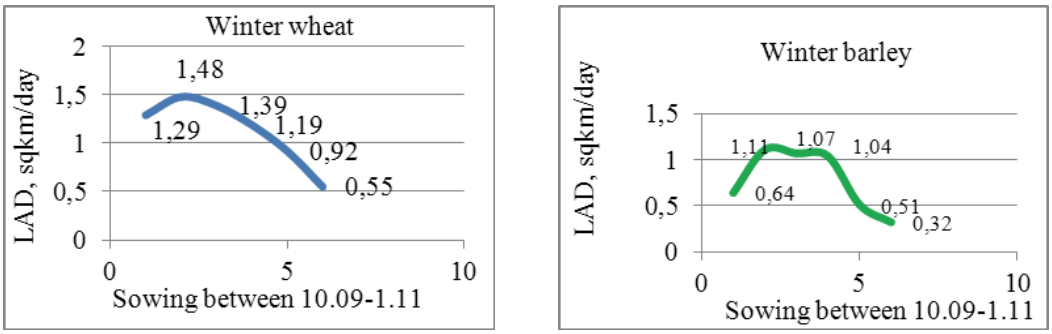


Figure 3. The evolution of photosynthetic potential (LAD) of wheat and barley in sowing time period

Net assimilation rate, NAR, is a parameter which characterizes the oscillation and better vegetation and physiology of these two plants, according to the sowing time moments. For wheat NAR was below 6 g/m^2/day sowing of Sep. 10 as well as to than of Nov. 1. Between Sep. 20 - Oct .20 values exceeded 6 g/m^2/day, and the highest value was obtained in Oct. 10, with 6.63 g/m^2/day. For NAR of barley had much different. The highest value was obtained to Oct. 10, with 7.05 g/m^2/day, exceeding that of wheat (Figure 4).

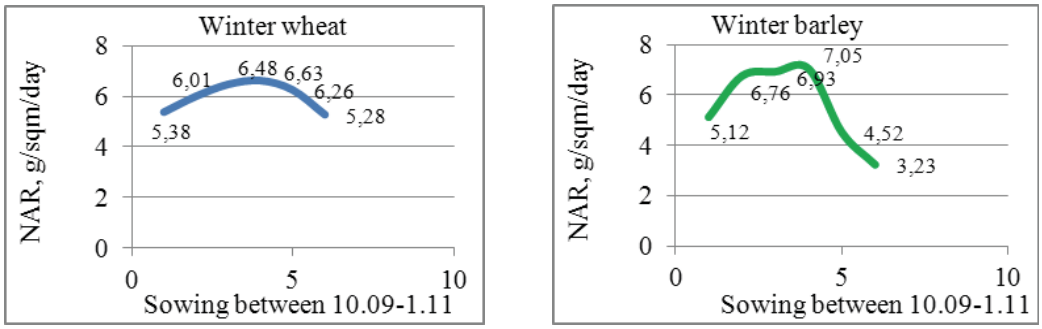


Figure 4. The evolution of net assimilation rates (NAR) of wheat and barley plants in sowing time period

Grain yields evolution, GY. Given six points sowing, grain yields have generally followed slight increase from Sep. 20, a maximum in Oct., after which they fell to the sowing of Nov. 1. For winter wheat (Lepădat, 1976), sowing in Sep. led to the formation of grains yields approximately equal

about 4 t/ha. Sowing of Sep. 20 is found in most years, water scarcity leading to delays emergence, plants disfavored. Best yields were formed in the range Oct. 1 to 10, followed by the Oct. 20. For barley higher yields were formed between Sep. 25 - Oct. 10 (Figure 5). Sowing of Sep. 10, plants springing were attacked by aphids, raising seedlings, and after Oct. 15-20 we found sensitivity to cold in the viter time.

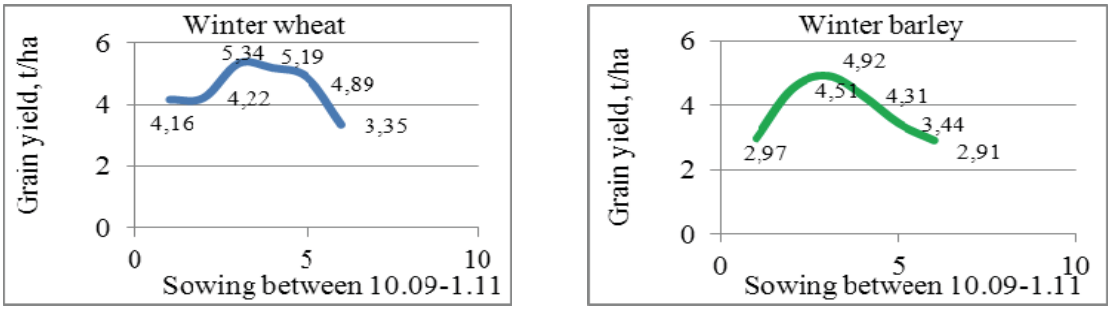


Figure 5. The evolution of wheat and barley grain yields from sowing time period

CONCLUSIONS

The sowing wheat and winter barley takes place today in a time interval in all three months of the autumn. The causes are multiple and physiology of plants that spring up are more or less affected. Over time it was found that through sowing period as accurately as it can provide the most vigorous plant growth on leaf surface plays an important role.

Leaf area index (LAI) experienced a greater increase during early sowing (Sep. 10 - Oct. 1). Both wheat and barley higher values were 9.2 m^2 leaf/m^2 ground for wheat and 7.4 for barley. For late sowing only on Oct. 10 plants grew more vigorously, with higher maximum LAI. Maximum LAI for sowing in Nov. 1 it was lowest at both plants.

Photosynthetic potential, LAD, was highest in wheat on Sep. 20, with 1.48 km^2/day, and the same in barley sowed on Sep. 20 with 1.11 km^2/day. With these values demonstrates that both wheat and barlex to develop their highest potential in an earlier period.

Net assimilation rate, NAR, show a relative uniformity for wheat from period Sep. 20 - Oct. 20. The barley peak was located between Sep. 20 to Oct. 10. Between the two determinations: NAR and LAD there is an inconsistency, especiallz for wheat. For the barley the two sizes showed a relatively similarity.

The production of grain, such as wheat and barley, performed differently depending on the moment of sowing. Wheat maximum was located at Oct. 1, with an extension until Oct. 10 to 20, and barley on Oct. 1, with the limits between Sep. 25 and Oct. 10.

Photo 2. Winter barley with maximum LAI

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