GROWTH ANALYSIS OF EARLY GENOTYPES OF COMMON BEANS

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INTRODUCTION: The common bean (*Phaseolus vulgaris* L.) has economic importance in several countries and is considered an important source of protein for the people. Embrapa Rice and Beans developed earlier cycle genotypes of common bean to allow achieving high grain yields in shortest time (Nascente & Melo, 2015). These genotypes have life cycle of 65-75 days, while traditional cultivars have 90-100 days. Therefore, this new materials should be characterized in more detail in order to develop a management system that allows fully exploit their genetic potential. Growth analysis is a technique which details the allocation of photosynthate partition as a function of the age of the plant. Determination of dry matter (plant and its parts: stems, leaves and pods) is the most suitable for the growth analysis (Taiz & Zeiger, 2004). With the results of the grow analysis we can verify the material more adapted material for the management systems used (Andrade et al., 2009). The aim of this study was to characterize the agronomic performance of three elite genotypes of common bean with early cycle by growth analysis technique.

MATERIAL AND METHODS: The irrigated field experiment was performed on autumn/ winter (May to July) in 2015 at the Capivara farm from Embrapa Rice and Beans in Santo Antônio de Goiás, GO, Brazil. A field experiment with a randomized block experimental design with eight replications was conducted in Brazil. The treatments consisted of common bean genotypes with early maturity, CNFC 15873, CNFC 15874 and CNFC 15875, we also included the check cultivar 'Colibri'. Sowing of common bean was mechanically held on May 29th, 2015, spaced 0.50 m between rows and with 15 viable seeds per meter. Fertilization in sowing furrows in all treatments was 45 kg ha^{-1} of N as urea and 60 kg ha^{-1} of P_2O_5 as simple superphosphate. In the V4 vegetative stage of the common bean (four trifoliate leaves), a topdressing fertilization of 45 kg ha^{-1} of N as urea was performed for all plots. Other cultural practices were performed according to the recommendations of the crops to keep the area free of weeds, disease and insects. It was collected plants periodically in a linear meter in each plot for the realization of the growth analysis. Bean plants were separated into stems, leaves and pods. We made the mass accumulation graphs of dry matter of each plant structure and total. At harvest time it was made the evaluation of the yield and yield components of each genotype. Data were subjected to an analysis of variance, and the means were compared by Tukey's test at $p<0.05$.

RESULTS AND DISCUSSION: The CNFC 15874 genotype showed the highest dry matter mass of pods (97.0 g m^{-1}) and total (165.6 g m^{-1}) in relation to genotypes 'Colibri' (88.3 g m^{-1} and 163.1 g m^{-1} for pods and total, respectively), CNFC 15873 (62.6 g m^{-1} and 126.5 g m^{-1} for pods and total, respectively) and CNFC 15875 (82.1 g m^{-1} and 133.5 g m^{-1} for pods and total, respectively) at 67 days after sowing (Figure 1). This better development of CNFC 15874 also allowed the highest grain yield (2784 kg ha^{-1}), which differed significantly from genotypes CNFC 15873 (2268 kg ha^{-1}), Colibri (2027 kg ha^{-1}) and CNFC 15875 (1807 kg ha^{-1}) (Table 1). The highest dry biomass accumulation for pods and total of CNFC 15874 could be related to the genotype potential. Nascente & Melo (2015) that performed the trial on the growing season 2014 also related that CNFC 15874 was the more productive genotype. It was observed that all genotypes accumulated dry biomass in the leaves and stems until 60 days after sowing. After this period, leaves and stems dry matter

started to decline indicating that there was translocation of their photoassimilates to the pods. According to Wien et al. (1976) during the period of formation and filling of seeds there is translocation of photoassimilates from the leaves and stems to pods. From the results, we can observed that the use of growth analysis technique allow explaining the better development of the genotype CNFC 15874, which resulted in higher grain yield in relation to the others tested genotypes.

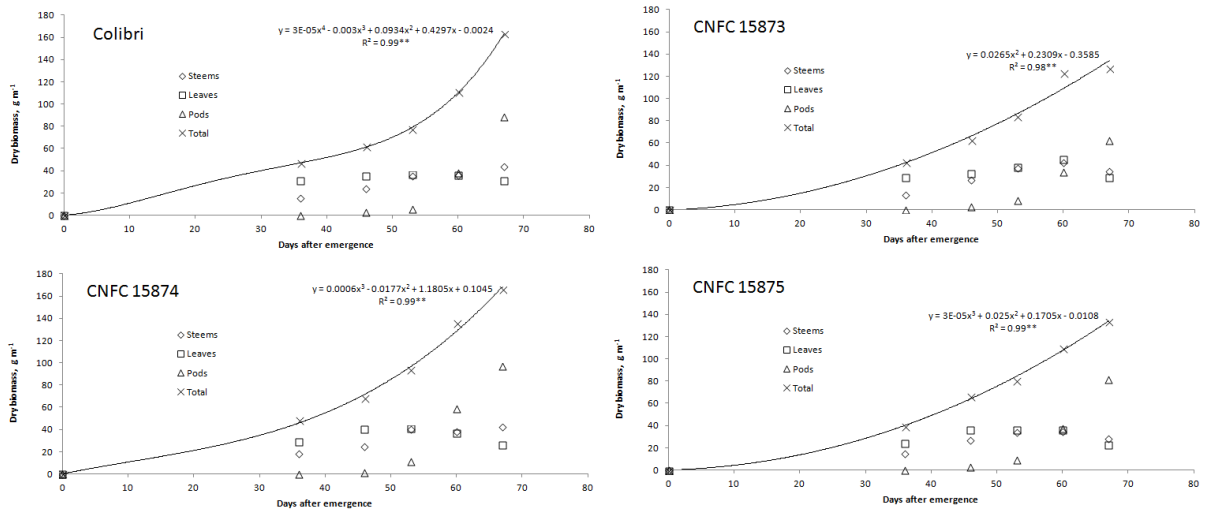

Figure 1. Growth analysis of four common beans genotypes ('Colibri', CNFC 15873, CNFC 15874 and CNFC 15875) cultivated in Santo Antônio de Goiás, Goiás State, Brazil in the growing season 2015.

Table 1 – Number of pods per plant (NPP), number of seeds per pods (NSP), mass of 100 seeds (MASS) and yield of early genotypes of common beans. Santo Antônio de Goiás, Brazil, growing season 2015.

Genotypes	NVP	NGV	MASS	YIELD
Colibri	11 b[/1]	5 a	21 a	2027 bc
CNFC 15873	14 a	5 a	18 b	2268 b
CNFC 15874	15 a	4 a	22 a	2784 a
CNFC 15875	10 b	4 a	22 a	1807 c
Factor	ANOVA (F probability)			
Genotype	<0.001	0.4376	0.0382	<0.001
Coefficient of variation (%)	8.47	10.17	2.83	12.91

[/1] – means followed by the same letter are not significantly different at p<0.05 according to Tukeys's test.

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