Dry Matter Production of Shoots and Root Density of Two Cultivars of *Lablab purpureus* (L.) Sweet

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DRY MATTER PRODUCTION OF SHOOTS AND ROOT DENSITY OF TWO CULTIVARS OF *Lablab purpureus* (L.) Sweet

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Abstract

This experiment was conducted in green house conditions to evaluate the DM accumulation in the shoots and in the roots of two cultivars of *Lablab purpureus* (L.) Sweet. A 2x3 factorial (two cultivars and three evaluation dates) was conducted according to a randomized complete block design with four replications, being the cultivars Highworth and Rongai evaluated at 42, 56, and 70 days after seedling emergence (DASE). The results indicated that the cvs. Highworth and Rongai have the same pattern of DM accumulation in the shoots. In the upper layer of the soil (0-0.20 m) it was found 38.83% and 43.64% of the DM accumulated in the roots down to 2.00 m depth, in the cvs. Highworth and Rongai, respectively. In the deepest layer (1.80-2.00 m) it was found 3.02% and 1.5% of the DM accumulated in the roots of the cvs. Highworth and Rongai, respectively. The root density showed a striking decrease upper layer from the soil (0-0.2 m) down to the depth of 0.60 - 0.80 m (from 10.83 to 1.75 $cm.cm^{-3}$ in the cv. Highworth and from 10.76 to 1.28 $cm.cm^{-3}$ in the cv. Rongai). At the bottom layer (1.80-2.00 m) the root density values were 0.98 $cm.cm^{-3}$ and 0.59 $cm.cm^{-3}$, respectively for the cvs. Highworth and Rongai. The root/shoot ratios were similar in both cvs. and decreased from 42 to 70 DASE showing that the cvs. evaluated had the same dynamics of DM accumulation.

Keywords: dry matter, lablab, legumes, root/shoot ratio, root system, roots

Introduction

Lablab (*Lablab purpureus* (L.) Sweet) is a fast-growing herbaceous legume, annual or short-lived perenial, well adapted to a wide range of climate and soils in Brazil. It has several uses such as hay, silage, and grazing (Hendricksen and Minson, 1985). However, there are few studies evaluating the growth and distribution of the root system of the species. Therefore, this work was conducted to study the dry matter accumulation in the aerial parts and roots and the root density in two cultivars of lablab (cvs. Highworth and Rongai).

Material and Methods

This experiment was carried out in greenhouse conditions at UNESP, in Jaboticabal-SP. A 2x3 (2 cultivars and 3 ages of evaluation) was used to study the dry matter accumulation in the shoots and in the roots of the plants. The experiment was conducted according to a randomized completely block design, with four replications, being the cultivars, namely Hithworth and Rongai, evaluated at 42, 56, and 70 days after the seedling emergence (DASE). The sowing was done in tubes of 0.15 m of diameter and 2.00 m long, arranged in the vertical position in the greenhouse. The tubes were filled with a dark-red Latossol (pH=4.3; organic matter=1.72%; P=21*, $Ca^{++}+Mg^{++}$=0.8*; K^{+}=0.16* and $Al^{+++}+H^{+}$=3.9*; *$\mu g.cm^{-3}$). Tensiometers were used to maintain the soil water tension between -0.02 and -0.04 Mpa, and the emergence occurred three days after sowing. To avoid mineral deficiencies plants were irrigated with Hoagland's solution number 1 (Hoagland and Arnon, 1950). The irrigation was done 21 DASE applying 100 ml of the solution $tube^{-1}.day^{-1}$. The evaluation of the root system was done cutting the tubes in segments of 0.2 m using a

washing-separating machine. After cleaning, the roots were maintained in bottles containing a solution (20% alcohol) and stored in the refrigerator. Afterwards, the root length was measured by the method of Tennant (1975) and the root density was calculated dividing the total root length by the soil volume for every segment of 0.2 m from the top (0-0.20 m) to the bottom (1.8-2.0 m).

Results and Discussion

The DM accumulation in the aerial parts and in the roots of the cvs. Highworth and Rongai from 42 to 70 days DASE is shown in Figure 1. The differences observed are consistent with many reports of the literature pointing out that the lablab is a fast-growing legume as indicated by Hendricksen and Minson (1985). It was observed that the DM accumulation in the aerial parts of the plants was affected ($p<0.05$) by age of the plant (A), cultivar (C), and by the interaction AxC. However, the differences were of small magnitude (Figure 1). In general, the cultivars presented the same pattern of DM accumulation from 42 to 70 DASE.

The DM accumulation in the roots was affected ($p<0.05$) by plant age (A), cultivar (C), and by the interaction AxC. At 42 DASE there was no difference among cultivars, but at 70 DASE the cv. Highworth had accumulated 7.09% more DM in the roots than the cv. Rongai.

There is little information on the root growth of forage plants. More scarce, are the papers, which discuss the distribution and the density of roots at different depths (Inforzato and Mascarenhas, 1967; Klepper, 1991; Rodrigues, 1993). The data obtained in this work allowed to calculate that 38.83 and 43.64% of the DM accumulated in the roots till the depth of 2.00 m was found in the top 0.20 m in the cvs. Highworth and Rongai, respectively. In the

last 0.20 m (from 1.80 to 2.00 m) it was found 3.02% and 1.58% of the DM accumulated in the roots of the cvs. Highworth and Rongai, respectively.

Inforzato and Mascarenhas (1967) observed that 28% of the roots of the lablab (variety 697) were in the top 0.20 m of a "massapê-salmourão" soil (dark-red Latossol) and 72% of the root system was distributed homogeneously until the depth of 3.40 m.

The root density (Figure 2) showed a striking decrease from the upper layer of the soil (0-0.20 m) down to the depth of 0.60-0.80 m (from 10.83 to 1.75 $cm.cm^{-3}$ in the cv. Highworth and from 10.76 to 1.28 $cm.cm^{-3}$ in the cv. Rongai). From the depth of 1.00 m down to 2.00 m, the root density values tended to decrease leniently. At the bottom layer (1.80-2.00 m) the root density values were 0.98 $cm.cm^{-3}$ and 0.59 $cm.cm^{-3}$, respectively for the cvs. Highworth and Rongai.

The calculated values of root/shoot ratios at 42, 56, and 70 DASE were 0.45; 0.39; and 0.36; and 0.43; 0.38; and 0.36 for the cvs. Highworth and Rongai, respectively. The root/shoot ratio showed that the cvs. evaluated have the same pattern of DM accumulation.

It is concluded that the cultivars have the same pattern of dry matter accumulation in the root and short from 42^{nd} to 70^{th} day of growth.

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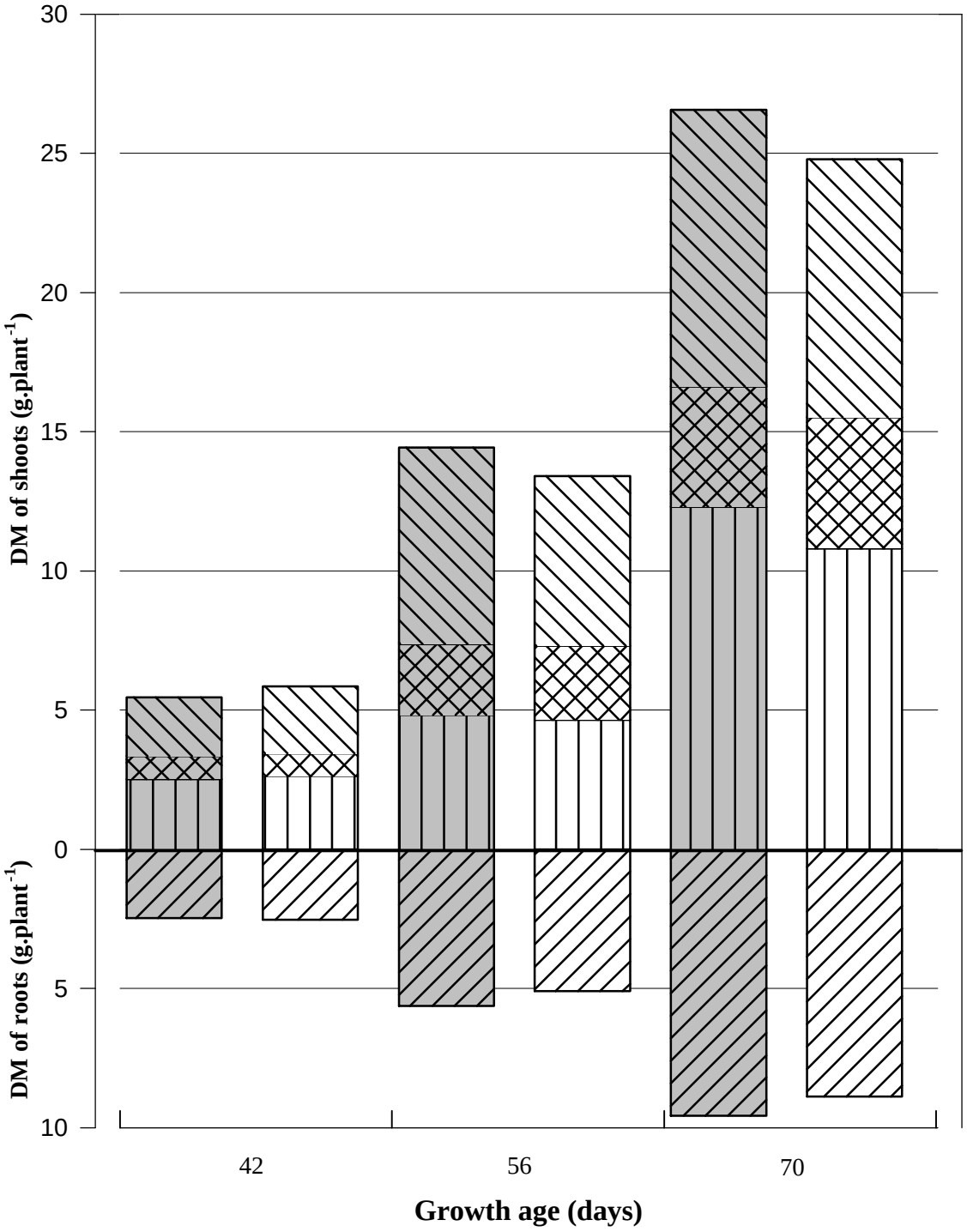

Figure 1 - Dry matter (DM) of shoot parts [stems ( ), petioles ( ),and leaf-blades ( )] and roots ( ) of two lablab cultivars: Highworth ( ) and Rongai ( ), at 42, 56, and 70 days of growth.

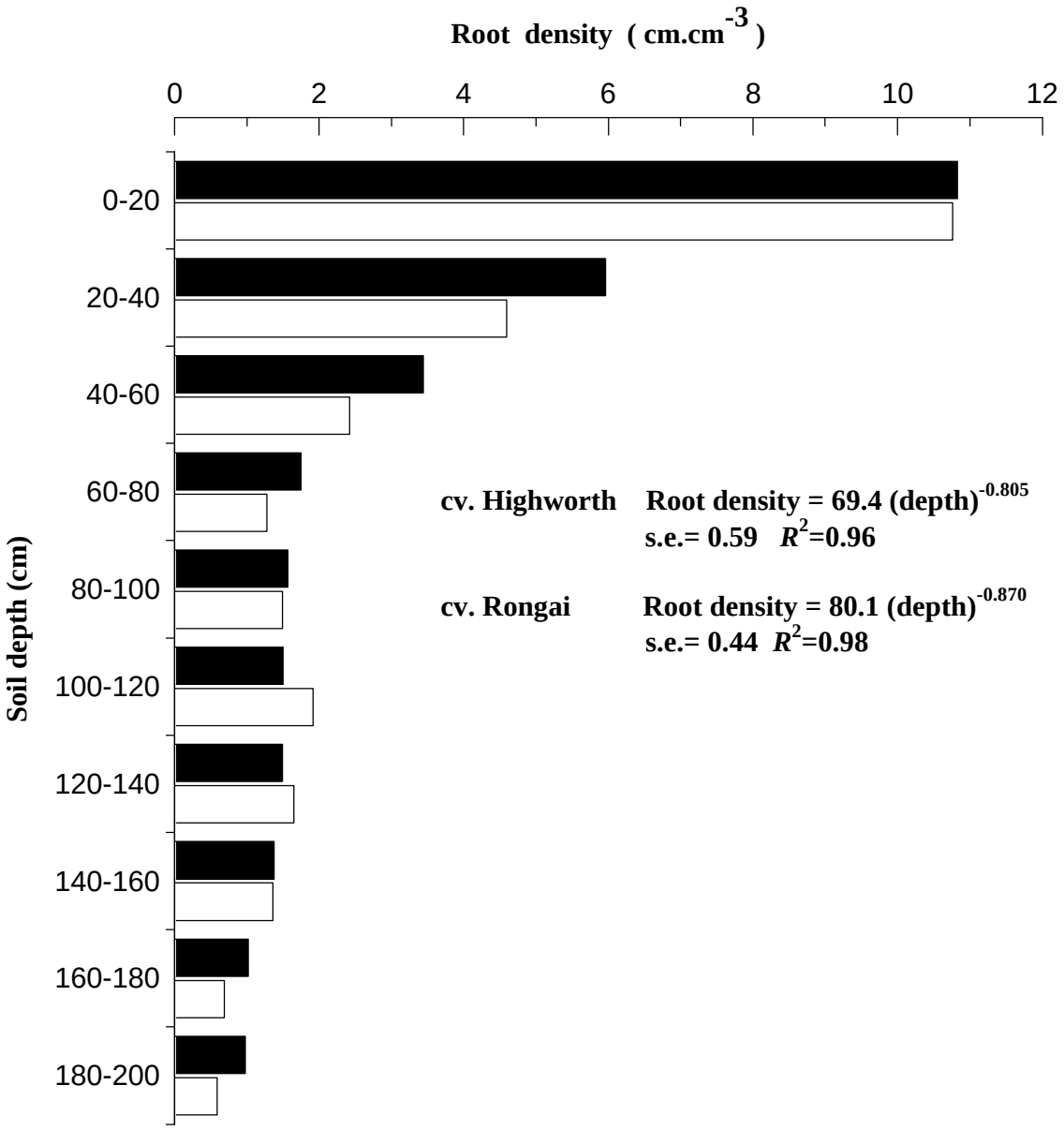

Figure 2 - Root density (cm.cm^{-3}) of lablab cultivars. Highworth (■) and Rongai (□) on the 70 th day of growth at different soil depths, from the top (0-20 cm) to the bottom layer (180-200 cm).