Bark : Core Ratio Relationships in Kenaf

Piergiorgio Gherbin, Anna Rita Rivelli, Salvatore Pizza, Susanna De Maria

Dep. of Crop Systems, Forestry and Environment Sciences, University of Basilicata, demariasusanna@libero.it

Currently, the main interest for kenaf (*Hibiscus cannabinus* L.) is due to the peculiar characteristics of the stem and of its fibres in particular. The two main components of the stem are the external part, containing the longer fibres (bark), and the inner part containing shorter fibres (core). The outer bark fibres are very appreciated for several industrial products, as high grade pulps for paper, composite boards and textiles (Mc Millin et al., 1998). Conversely, the inner core fibres have a smaller market value and are suitable for products such as pulps for packaging, animal bedding, sorbents and horticultural mixes (Muzzarelli, 1994). Therefore, for defining the industrial quality of stalks, the bark : core ratio is one of the most important parameters to evaluate. In this work data from a research carried out in southern Italy are reported, to assess the pattern and some relationships of the bark : core ratio during the whole crop cycle of the kenaf.

Methodology

The trial was carried out in 2004 in Basilicata region (Metaponto plane, 40° 02' N; 16° 55' E) on silty-clay soil with good fertility. Kenaf was irrigated by the restitution of three levels of evapotranspiration (ETc 100%, 66%, 33%); two genotypes were tested: Tainung 2 and Guatemala 4, the latter only fully irrigated. The split-plot experimental design with three replicates was adopted. The sowing, with rows at the distance of 0.5 m, was performed on late April adopting a single-row pneumatic driller and a seed rate of 70 seeds m^{-2}. Four plants samples were collected every two weeks, starting from 48 days from sowing (dfs), until early January 2005 (265 dfs). Morphological (height, basal and medium stem diameter) and productive (bark and core fresh and dry matter) parameters were measured.

Results

In general, the bark : core ratio showed a linear decreasing during the crop cycle, starting from values ranging from 0.8 to 1.0 during the second month after sowing, to values ranging from 0.5 to 0.6 at the end of the cycle, for all the compared treatments (Fig. 1). The latter values are similar to those reported by Mambelli and Grandi, 1995, Losavio et al., 1997, McMillin et al., 1998, Alexopoulou et al., 2000, Bañuelos et al., 2002, nevertheless only few information is available about the bark : core ratio pattern during the crop cycle.

The bark : core ratio vs. plant height and vs. stem diameters relationships showed for all treatments values decreasing with increasing of the single morphological parameter. No significant difference was observed between genotypes at the same irrigation level. On the contrary, among irrigation treatments, restitution of 33% ETc showed a different pattern as compared with the other treatments, not different each other, both with reference to plant height (Fig. 2) and to stem diameter, basal (data not showed) and medium (Fig. 3). This is due to the strong effect of the fall down in water availability on all traits of the plant and on the reduction of the biological cycle length that stops vegetative growth.

Considering the linear relationship between stem dry matter production and plant height (Fig. 4), consistent with prior results (Weng et al., 1988; Mambelli and Grandi, 1995; Webber and Bledsoe, 2002) and also stem diameter (data not showed), the bark and core yields could be simply estimating by measuring only one of the above mentioned parameters during the whole crop cycle.

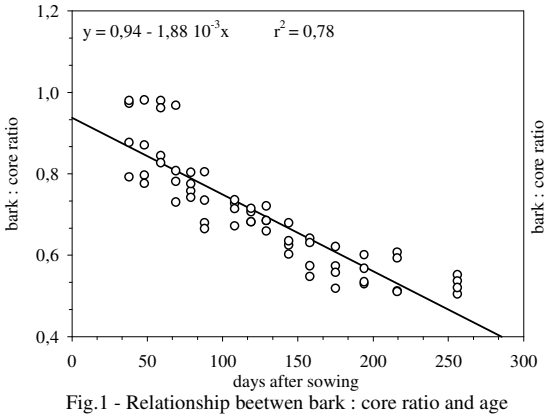

Fig.1 - Relationship beetwen bark : core ratio and age of the plant.

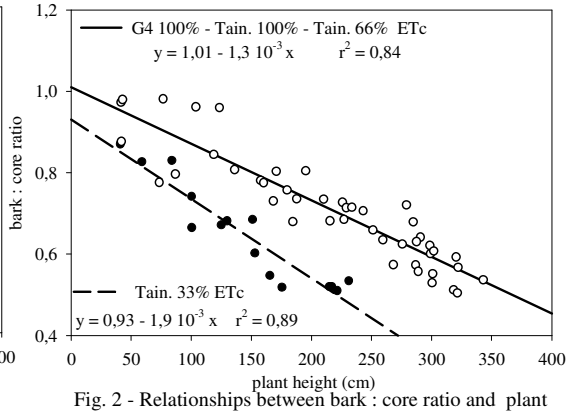

Fig. 2 - Relationships between bark : core ratio and plant height for the compared treatments.

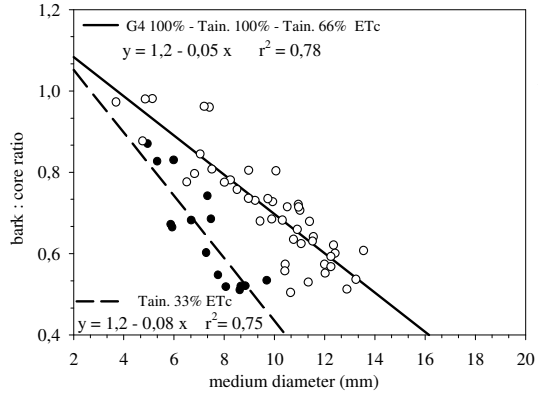

Fig. 3 - Relationships between bark : core ratio and plant medium diameter for the compared treatments.

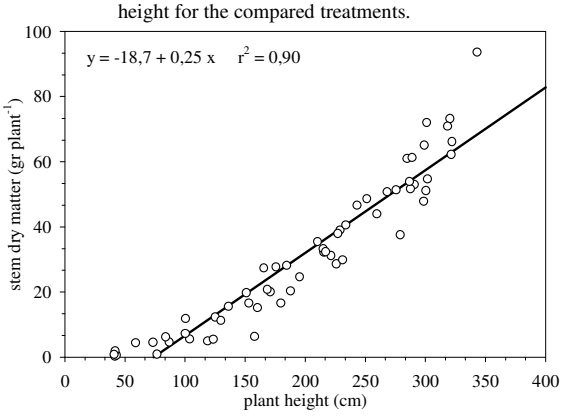

Fig. 4- Relationship between plant height and stem dry matter.

Conclusions

Results demonstrate that:

- the bark : core ratio decreased as kenaf increased in size;
- only very low irrigation level affected relationships between bark : core ratio and plant height or diameter;
- according to the above mentioned relationships, stem, bark and core dry matter yields could be simply estimating by measuring, during the whole crop cycle, one of the morphological traits considered.

References

Alexopoulou E. et al., 2000. Growth and yields of kenaf varieties in central Greece. Industrial Crops and Products, 11: 163-172.

Bañuelos G.S. et al., 2002. Vegetative production of kenaf and canola under irrigation in central California. Industrial Crops and Products, 15: 237-245.

Losavio N. et al., 1997. Effetti del regime idrico sulla risposta produttiva e qualitativa del kenaf (*Hibiscus cannabinus* L.) coltivato in ambiente mediterraneo. Riv. di Agron., 4: 1001-1008.

Mambelli S. and Grandi S., 1995. Yield and quality of kenaf (*Hibiscus cannabinus* L.) stem as affected by harvest date and irrigation. Industrial Crops and Products, 4: 97-104.

Mc Millin J.D. et al., 1998. Potential for kenaf cultivation in south-central Arizona. Industrial Crops and Products, 9: 73-77.

Muzzarelli F., 1994. I prodotti cartari: protagonisti e caratteristiche del processo produttivo. In: Il kenaf: materia prima per l'industria, Vannini L. and Venturi G. Eds. Ed. L'Informatore Agrario.

Webber C.L. III and Bledsoe V. K., 2002. Plant maturity and kenaf yield components. Industrial Crops and Products, 16: 81-88.

Weng C.H. et al., 1988. Effects of harvesting date on fibre yield and quality of kenaf and jute. Acta Agronomica Sinica, 1: 27-32.