

Visual Evaluation of Soil Structure in *Brachiaria decumbens* cv. Basilisk Swards

Junior Cesar Avanzi^{1,2}, Bruna Scalia de Araújo Passos², Caio Augusto Bertolini², Leticia Gasparini Palmeira², Valdo Rodrigues Herling², Pedro Henrique de Cerqueira Luz², Lilian Elgalise Techio Pereira²

¹ Federal University of Lavras, Department of Soil Science, Lavras, MG, Brazil, junior.avanzi@dcs.ufla.br;

² University of São Paulo, Faculty of Animal Science and Food Engineering, Pirassununga, SP, Brazil.

Introduction

- Soil structure is a complex soil property, partly related to inherent characteristics of particle size and clay mineralogy and partly to anthropogenic influences related to land use and management (Ball et al., 2007).
- Soil structure can be described in terms of (Ball et al., 2007):
 - ✓ (i) structural form; the heterogeneous arrangement of pores and solids at any given time;
 - ✓ (ii) structural stability, the ability of soil to retain its structural form after exposure to stress; and
 - ✓ (iii) structural resilience: the ability of soil to recover its structural form through natural processes.
- Visual Evaluation of Soil Structure (VESS) method (Ball et al., 2007; Guimarães et al., 2011) analyze in field the aspects of soil structure and rooting. A distinctive feature of VESS is the ability to distinguish layers in the topsoil of differing structure.
- This work aimed to evaluate the soil structure applying VESS method in an area with *Brachiaria decumbens* cv. Basilisk swards under different levels of soil base saturation (V%) and grazing intensities.

Material and Methods

- The experiment was carried out at FZEA-USP, Pirassununga, SP, Brazil.
- *Brachiaria decumbens* cv. Basilisk was seeded in November 2012, and it was maintained under free growth until October 2014, then rotational stocking was employed based on the criterion of 95% of light interception.
- Treatments comprised of combinations between three levels of soil base saturation (V% 35, 50 and 65) and two grazing intensities (40% and 60% of pre-grazing height) and were distributed in a randomized complete block design in a 3x2 factorial arrangement.
- At each plot the VESS method was performed and each layer of soil identified was classified into one of five categories (Figure 1).
- VESS was evaluated every 2 cm from 0 to 20 cm depth in triplicate (Figure 2).



Figure 2. Analyzing the visual soil structure according to the VESS chart.

Structure quality	Size and appearance of aggregates	Visible porosity and Roots	Appearance after break-up: various soils	Appearance after break-up: same soil different tillage	Distinguishing feature	Appearance and description of natural or reduced fragment of ~ 1.5 cm diameter
Sq1 Friable Aggregates readily crumble with fingers	Mostly < 6 mm after crumbling	Highly porous Roots throughout the soil			Fine aggregates	The action of breaking the block is enough to reveal them. Large aggregates are composed of smaller ones, held by roots.
Sq2 Intact Aggregates easy to break with one hand	A mixture of porous, rounded aggregates from 2mm - 7 cm. No clods present	Most aggregates are porous Roots throughout the soil			High aggregate porosity	Aggregates when obtained are rounded, very fragile, crumble very easily and are highly porous.
Sq3 Firm Most aggregates break with one hand	A mixture of porous aggregates from 2mm - 10 cm; less than 30% are < 1 cm. Some angular, non-porous aggregates (clods) may be present	Macropores and cracks present. Porosity and roots both within aggregates.			Low aggregate porosity	Aggregate fragments are fairly easy to obtain. They have few visible pores and are rounded. Roots usually grow through the aggregates.
Sq4 Compact Requires considerable effort to break aggregates with one hand	Mostly large > 10 cm and sub-angular non-porous; horizontal/platy also possible; less than 30% are < 7 cm	Few macropores and cracks All roots are clustered in macropores and around aggregates			Distinct macropores	Aggregate fragments are easy to obtain when soil is wet. In cube shapes which are very sharp-edged and show cracks internally.
Sq5 Very compact Difficult to break up	Mostly large > 10 cm, very few < 7 cm, angular and non-porous	Very low porosity. Macropores may be present. May contain anaerobic zones. Few roots, if any, and restricted to cracks			Grey-blue colour	Aggregate fragments are easy to obtain when soil is wet, although considerable force may be needed. No pores or cracks are visible usually.

Figure 1. Description and illustration of soil structure and distinguishing features in each of the five categories of quality (Guimarães et al., 2011).

Results and Discussion

- VESS results showed effect between of soil base saturation (V%) and grazing intensity (GI) ($P < 0.0001$).

Table 1. VESS soil quality (Sq) score for area of *Brachiaria decumbens* cv. Basilisk swards.

GI \ V%	35	50	60
40%	1.40 aA	1.20 bB	1.10 aB
60%	1.00 bB	1.43 aA	1.07 aB
S.E.M	0.0649	0.0649	0.0649

V% - soil base saturation; GI - grazing intensity; S.E.M. - standard error of the mean; capital letters compare grazing intensity and small letters compare soil base saturation.

- For all combinations, VESS Sq score were lesser than 2, indicating good structural quality of the soil and no changes needed in current management.

Conclusion

- More intensity of grazing with lower base saturation promote higher values of VESS, indicating a possible injury in soil structure. However, a higher base saturation helps to keep Sq score close to 1, regardless grazing intensity.

References

- BALL, B.C.; BATEY, T.; MUNKHOLM, L. (2007). Field assessment of soil structural quality – a development of the Peerlkamp test. *Soil Use and Management*, 23:329-337.
- GUIMARÃES, R.M.L.; BALL, B.C.; TORMENA, C.A. (2011). Improvements in the visual evaluation of soil structure. *Soil Use and Management*, 27:395-403.