

# BIOLOGICAL FUNCTIONING OF CERRADO SOILS UNDER CONVENTIONAL TILLAGE AND NO-TILLAGE SYSTEMS

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## INTRODUCTION



Soil microbial biomass, microbial respiration, and the activities of soil enzymes (acid phosphatase,  $\beta$ -glucosidase and arilsulfatase) have been evaluated at Embrapa Cerrados, since 1998.

The objective of these studies is to determine the impact of different agricultural management systems (conventional tillage and no-tillage) on soil functioning and to evaluate the possibility of using these parameters as biological indicators of soil quality.

## RESULTS

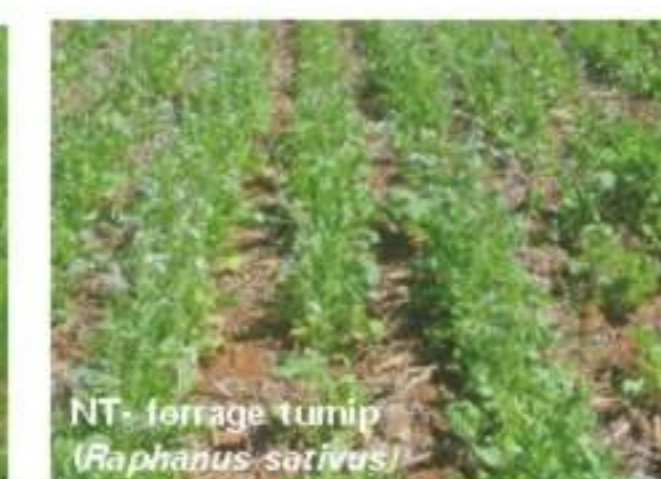
## MATERIAL & METHODS

TWO AREAS UNDER NO-TILLAGE (NT):

AREA 1- NT initiated in 1997



AREA 2 - NT initiated in 1992

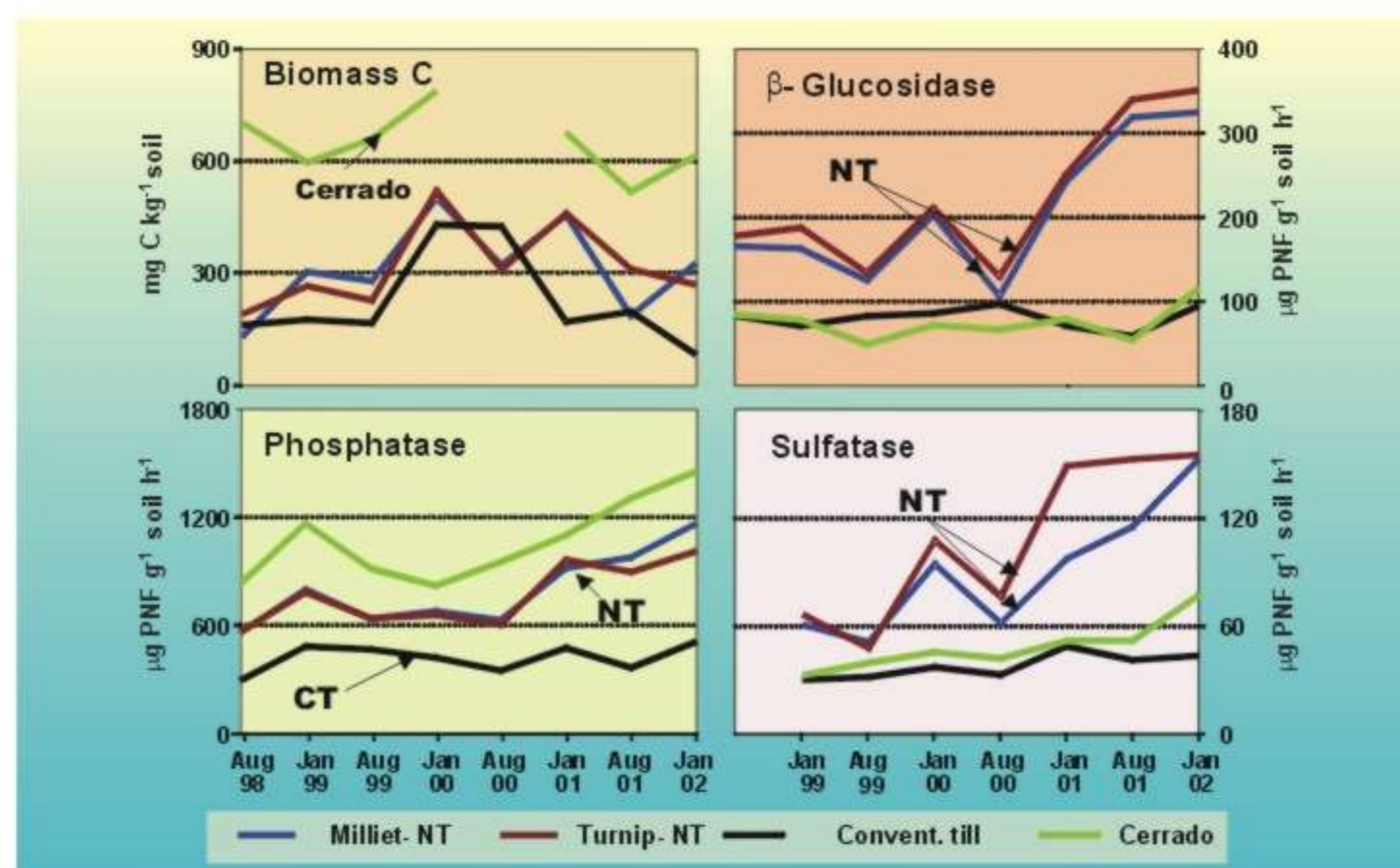


AREA 3

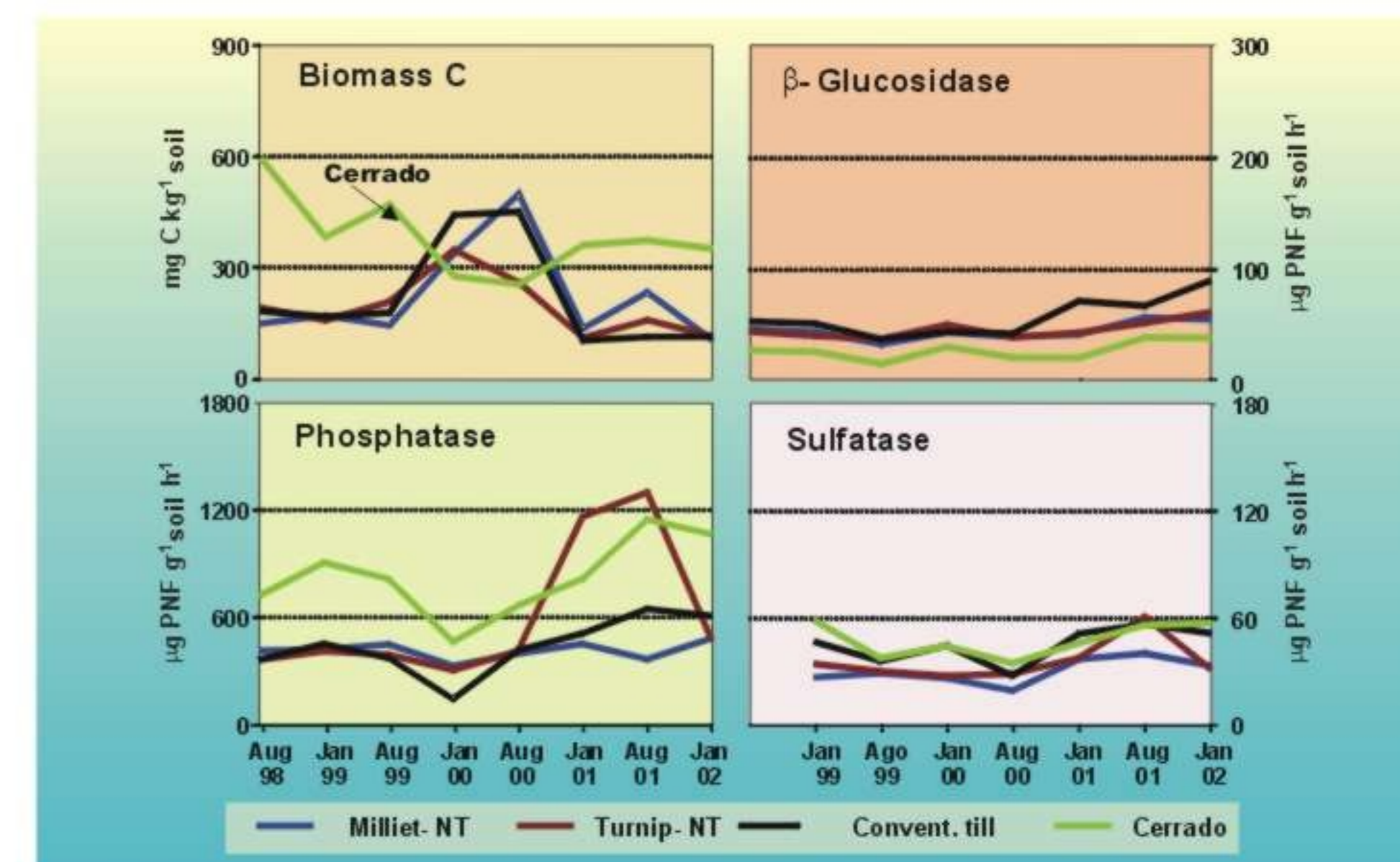


Reference: native Cerrado adjacent to areas 1 and 2

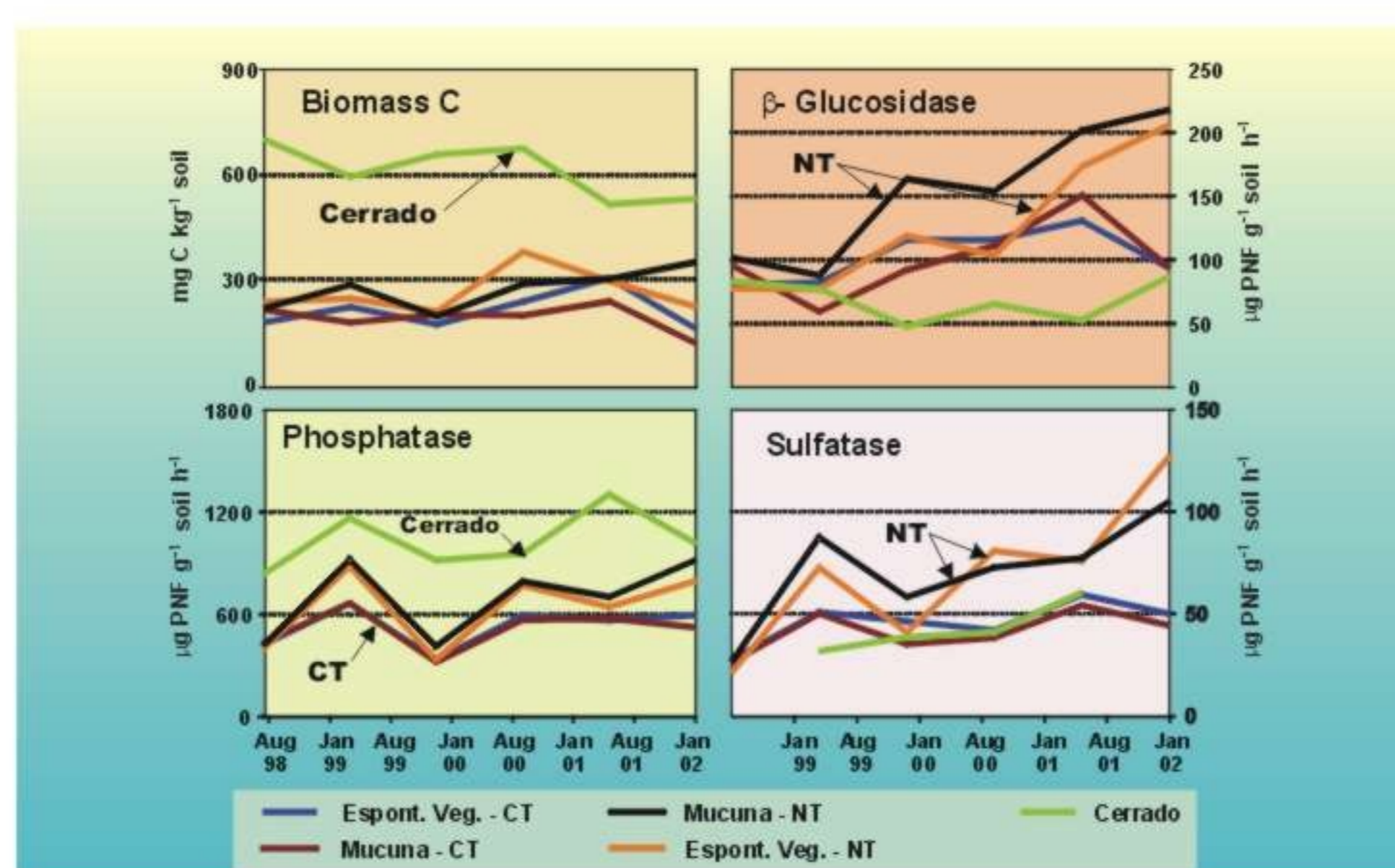
- Four samplings :
  - August 1998 and August 1999 (dry season)
  - January 1999 and January 2000 (rainy season)
- Two sampling depths:
  - 0 to 5 cm and 5 to 20 cm
- Four biological parameters:
  - Microbial biomass C (chloroform fumigation incubation)
  - Soil enzymes activities (Tabatabai, 1994)
    - $\beta$ -glucosidase (C cycle)
    - acid phosphatase (P cycle)
    - arylsulfatase (S cycle)



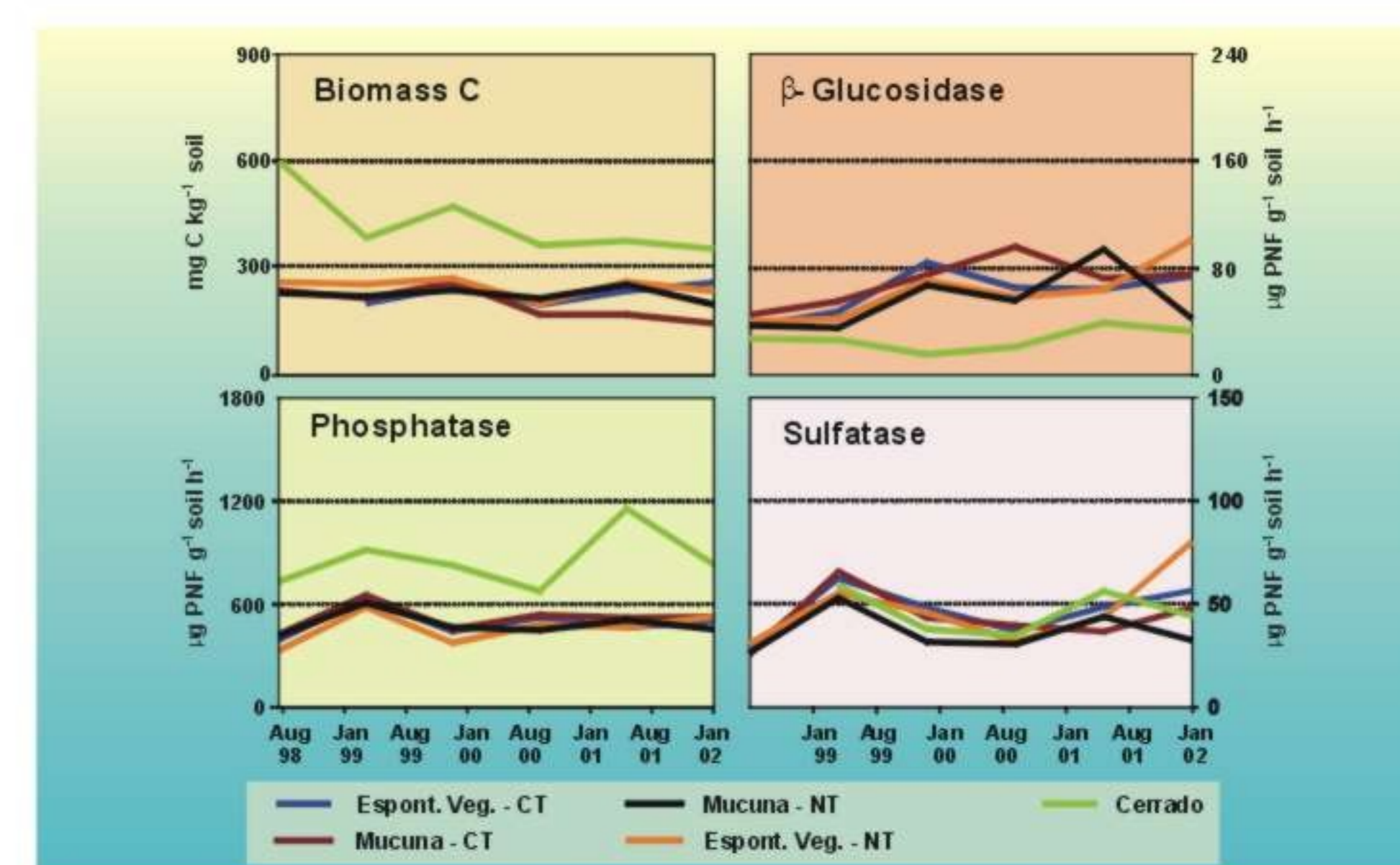
Biological parameters, in the area where the NT was initiated in 1992, at the 0 to 5 cm depth.



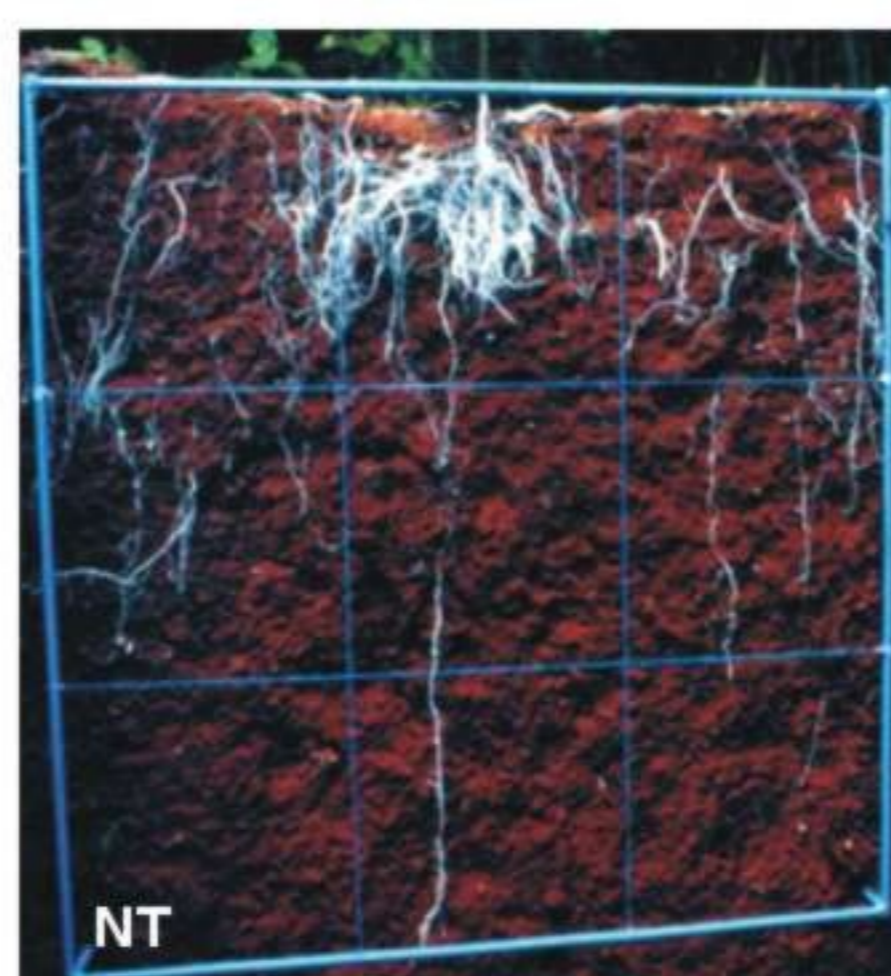
Biological parameters, in the area where the NT was initiated in 1992, at the 5 to 20 cm depth.



Biological parameters, in the area where the NT was initiated in 1997, at the 0 to 5 cm depth.



Biological parameters, in the area where the NT was initiated in 1997, at the 5 to 20 cm depth.



Roots distribution in areas under NT and CT (courtesy of Dr. D.M.G. Sousa).

|                               | Cerrado | NT   | CT   |
|-------------------------------|---------|------|------|
| 0 to 5 cm                     |         |      |      |
| Organic matter (%)            | 3,7     | 3,6  | 2,8  |
| P (ppm)                       | 0,5     | 14,0 | 7,7  |
| Acid phosphatase <sup>1</sup> | 1069    | 785  | 426  |
| S (ppm)                       | 29,2    | 29,2 | 34,8 |
| Arylsulfatase <sup>1</sup>    | 48      | 98   | 37   |
| 5 to 20 cm                    |         |      |      |
| Organic matter (%)            | 2,8     | 2,9  | 2,8  |
| P (ppm)                       | 0,3     | 5,4  | 6,4  |
| Acid phosphatase <sup>1</sup> | 830     | 514  | 444  |
| S (ppm)                       | 24,8    | 28,0 | 25,8 |
| Arylsulfatase <sup>1</sup>    | 33      | 45   | 48   |

<sup>1</sup> = mg p-nitrofenol g<sup>-1</sup> soil h<sup>-1</sup>

Soil chemical and biochemical properties in the area where the NT was initiated in 1992.

## CONCLUSIONS

In relation to the native Cerrado, located near the experiments, significant reductions in microbial biomass and phosphatase activity were observed in the agricultural areas at the 0 to 5 cm and 5 to 20 cm depths.

At the 0 to 5 cm depth, the no-tillage (NT) system presented higher levels of phosphatase, arilsulfatase and  $\beta$ -glucosidase activities as compared to the conventional tillage (CT). These effects were related to the lack of soil mechanical preparation, fertilizers placement, and to the accumulation of crop residues at the soil surface.

No differences between the NT and CT were observed at the 5 to 20 cm depth.

## ACKNOWLEDGMENTS

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