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Soil Respiration Rates under Different Land Uses in Northeastern Mexico

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Abstract

Determinations of CO_2 efflux, soil temperature and soil-water content were monitored between July 3, 2001 and January 29, 2002. At each sampling date, two daily measurements (at 08:00 and 14:00 h local time, named as morning and afternoon, respectively) were carried out. A dynamic closed chamber with a portable system EGM employing a infrared gas analyzer (IRGA) and a soil chamber (SRC) was used to assess soil CO_2 efflux throughout the experimental period in vertisols under different land uses in northeastern Mexico: Pasture (*Dichanthium annulatum*), *Leucaena leucocephala* in an alley cropping system, a native and undisturbed shrubland plot, *Eucalyptus microtheca* plantation, and a *Sorghum bicolor* field.

Results have shown that the *Eucalyptus* and pasture plots showed a highly significant and positive linear relationship between morning and afternoon soil respiration rate and soil temperature, while no significant relationship between any soil temperature and soil respiration for *Leucaena*, sorghum and shrubland land uses was found. Soil temperature alone explained 68 % of the variation in the efflux rate in *Eucalyptus* and 33 % in pasture. During the study period, average morning soil respiration rates for all land uses ranged from 0.7 to 8.4 μmol CO_2 m^{-2} s^{-1} (in Oct. and Aug., respectively), while afternoon soil respiration rates ranged from 0.6 to 14.4 μmol CO_2 m^{-2} s^{-1} throughout the experiment. Average morning and afternoon soil respiration rates showed the following decreasing CO_2 efflux order among the five investigated land uses pasture>shrubland>*Leucaena*>*Eucalytus*>sorghum, indicating that pasture plot showed the highest average morning and afternoon soil respiration rates 3.5 and 5.0 μmol CO_2 m^{-2} s^{-1}, respectively. In contrast sorghum shows the lowest average morning and afternoon soil respiration rates 1.9 and 2.5 μmol CO_2 m^{-2} s^{-1}, respectively.

Keywords: CO_2 efflux, *Dichanthium* grass, *Eucalyptus*, *Leucaena*, shrubland, soil respiration, sorghum, vertisol

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