

Soil acidity amelioration impact in a no-till system in west Tennessee – USA differs by cover crop type and nitrogen application rate



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INTRODUCTION

Conservation soil management practices may influence the soil acidity. Surface application of limestone may be required in no-till systems is to ameliorate soil acidity and to achieve high yields. The application of lime may also increase microbial activity on soil. Specifically, the microbial activity of soil can be determined by C-loss via respiration

Objective

We evaluated microbial respiration after lime was applied to no-till cotton fields that have been under different agricultural practices for 31 years.

Results

Table 1: Soil pH water before (initial) and 14 days (final) after liming application as affected by cover crop and nitrogen rates under no till system.

Covercrops	N doses (kg ha ⁻¹)			
	0	32	74	108
soil water pH initial				
no cover	5,27 aA	5,06 aB	4,77 aC	4,53 aD
vetch	5,19 aA	4,89 aB	4,44 bC	4,15 bD
wheat	5,12 aA	4,90 aB	4,78 aB	4,29 bC
soil water pH final				
no cover	6,08 aA	5,92 aAB	5,83 aAB	5,70 aB
vetch	5,82 bAB	5,90 aA	5,59 aB	5,63 aB
wheat	5,97 abA	5,99 aA	5,82 aAB	5,64 aB

Treatments means within a row and column followed by the same letter are not significantly different at the 0.05 level by LSD (P<0.05). Lowercase letters compare cover crop and capital letters compare the nitrogen rates.

However, **after lime** was used in the treatments with **vetch cultivation**, it was observed that there was **higher respiration** rate regardless of the use of nitrogen. Though some CO₂ measured as respiration likely came from added lime, the observed increases in respiration were above that expected from a purely inorganic CO₂-source.

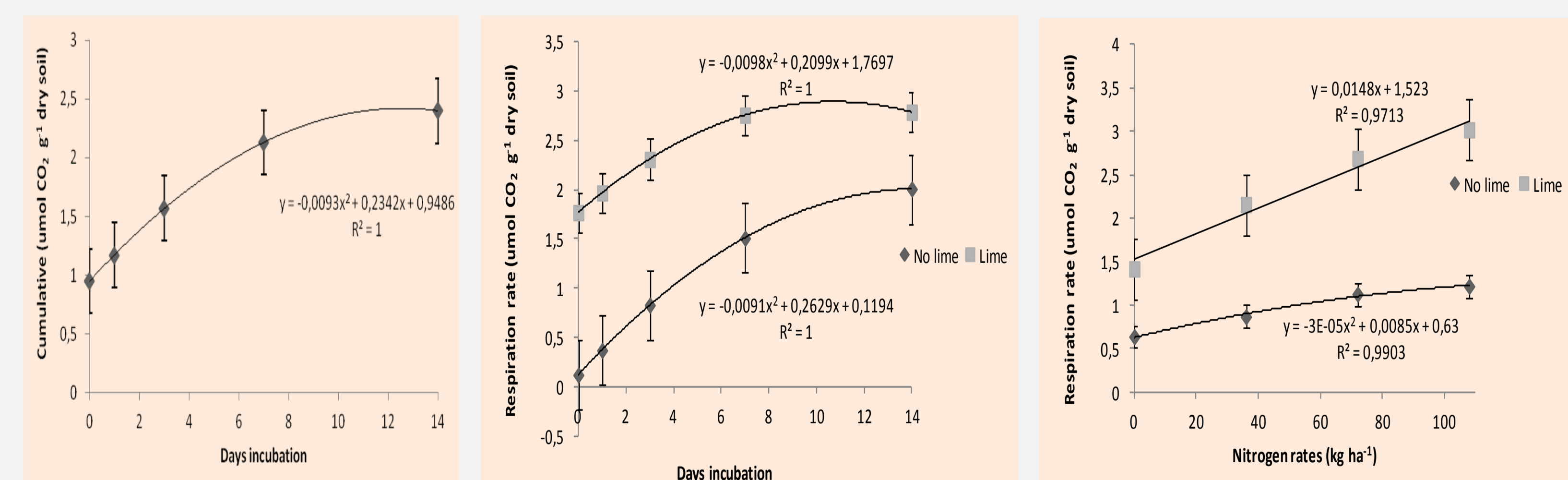


Figure 1: Cumulative respiration rates, respiration rate with and without lime and Nitrogen rates influenced the respiration during 14 days of soil incubation .



Conclusion

- High nitrogen fertilization rates and legume cover crops caused acidity in soil. -
- Soil respiration was significantly higher in limed compared to un-limed soils.
- Vetch cultivation increased the soil respiration rates.

Materials and Methods

Treatments consisted of: lime and no lime, nitrogen fertilizer rate application (0, 36, 72 e 108 kg ha⁻¹) and cover crop (no cover, vetch and wheat).

Soil samples were collected in Spring, 2014 from 0 to 10 cm depth.

Neutralized soil acidity using a pH buffer procedure to calculate doses for each plot.

Soil samples evaluation:

-pH (initial and final of experiment)

- respiration at 0, 1, 3, 7 and 14 days after liming using an infrared gas analyzer (IRGA, LICOR-820)

During the experiment, soil samples were incubated at 25 ° C in a laboratory conditions

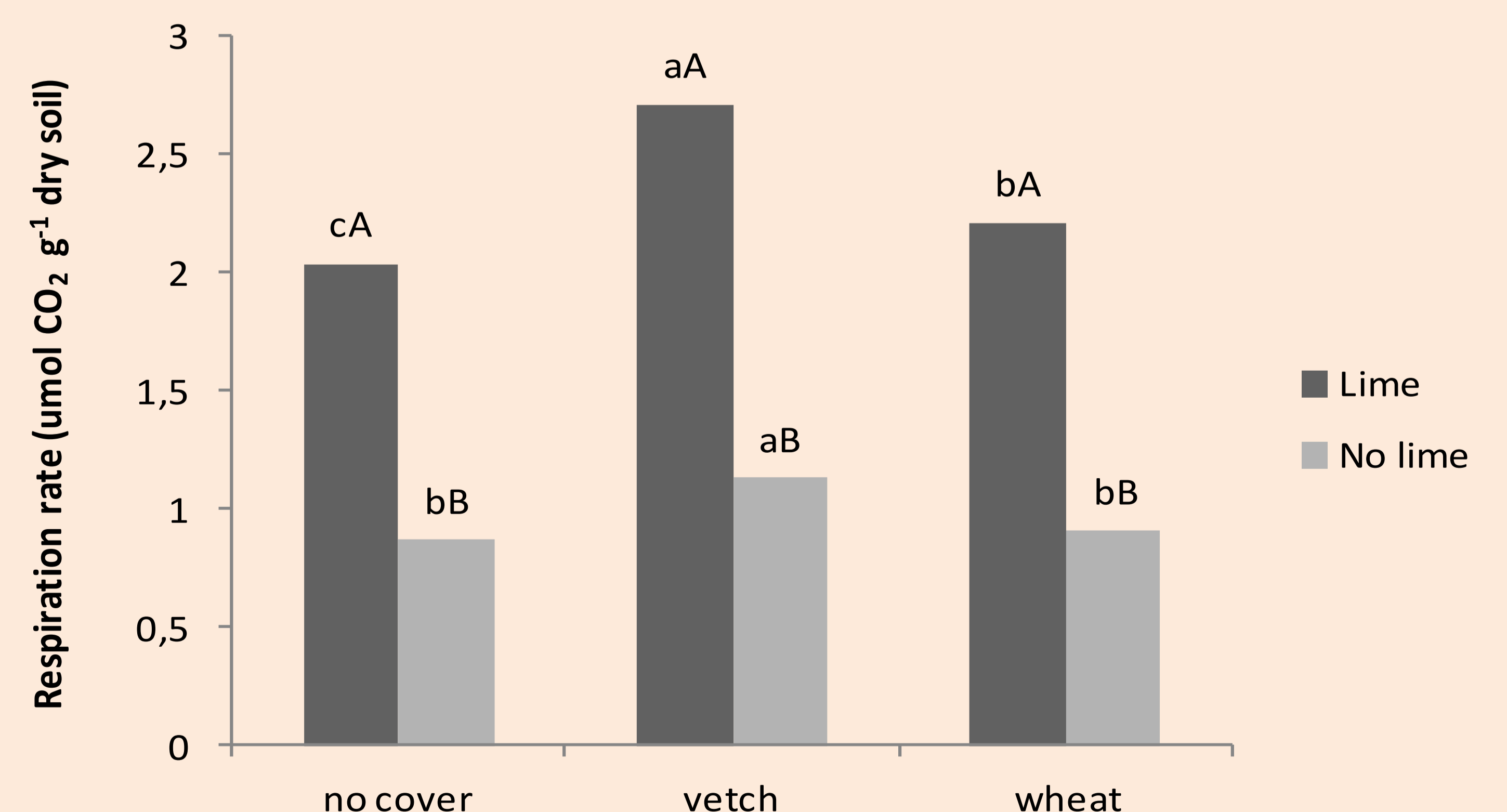
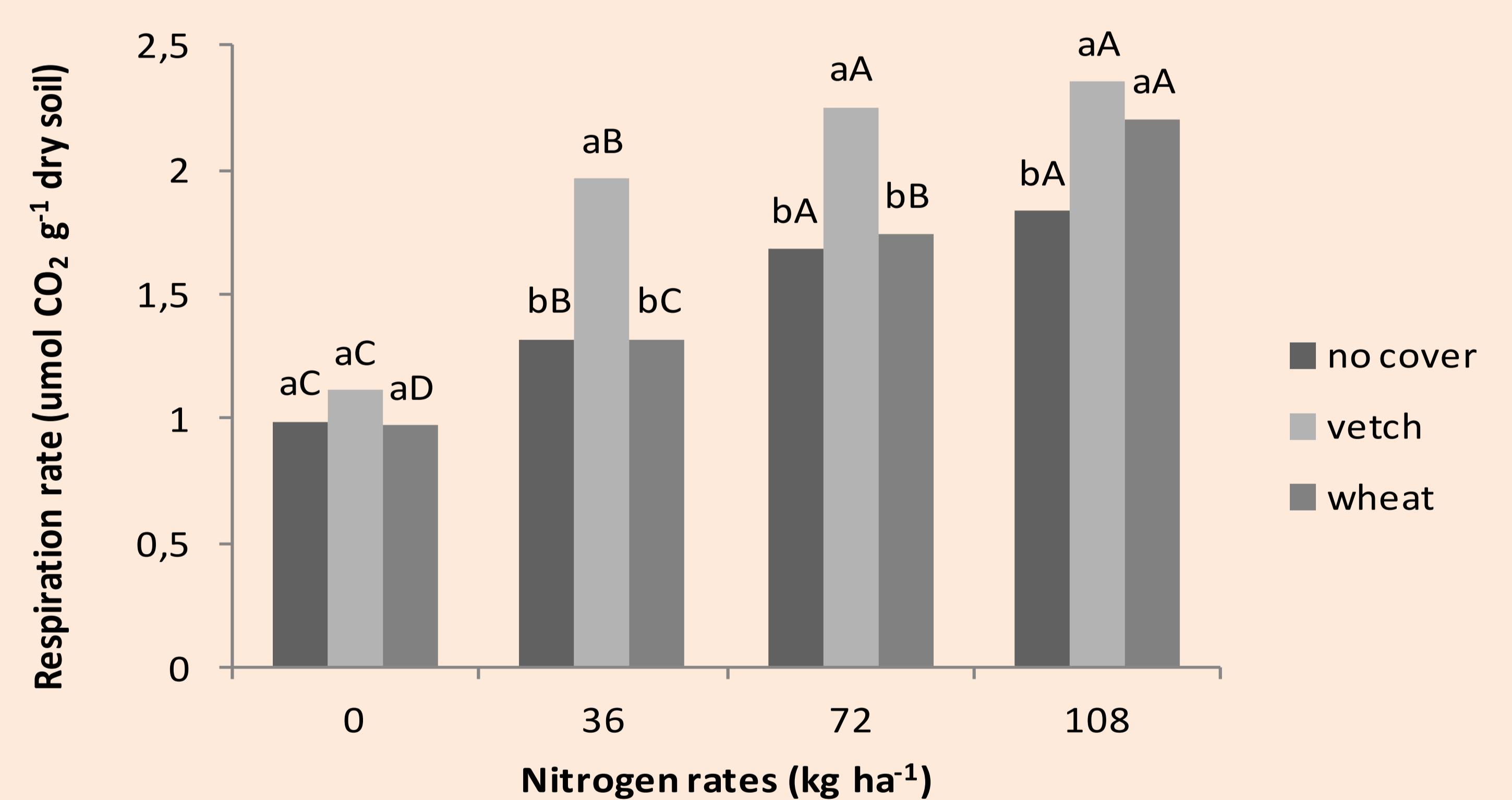


Figure 2: Respiration rates by influenced nitrogen rates and cover crops cultivation * Treatments mean within a lowercase letters compare cover crop and capital letters compare the nitrogen rates and lime application, followed by the same letter are not significantly different at the 0.05 level by LSD (P<0.05), during 14 days of soil incubation.