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Stability of urease inhibitor added to urea

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Common conditions for N fertilizer application in Brazil: no till; perennials & mulch: fertilizer incorporation is difficult

Why study the stability of NBPT

- **Urea: +60% of share of N fertilizer in Brazil.**
- **NH_3 volatilization is important: up to 20-40% losses surface-applied under high soil T and moisture**
- **Urease inhibitors sharply reduce NH_3 losses. Main inhibitor used is NBPT [N-(n-butyl thiophosphoric acid triamide)], trade name Agrotain.**
- **Shelf life of NBPT is of concern: decreased effectiveness**

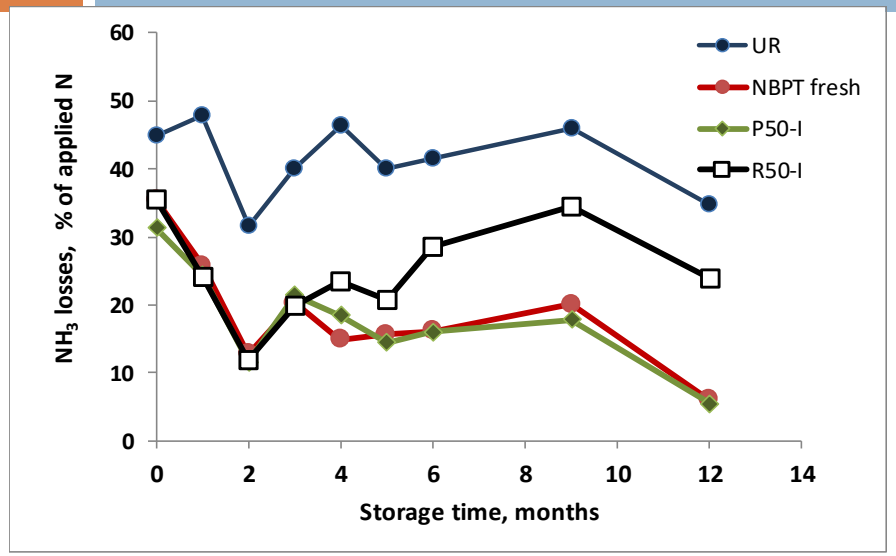
OBJECTIVE: to investigate the shelf-life of NBPT-treated urea stored in different bag sizes and locations with different climates

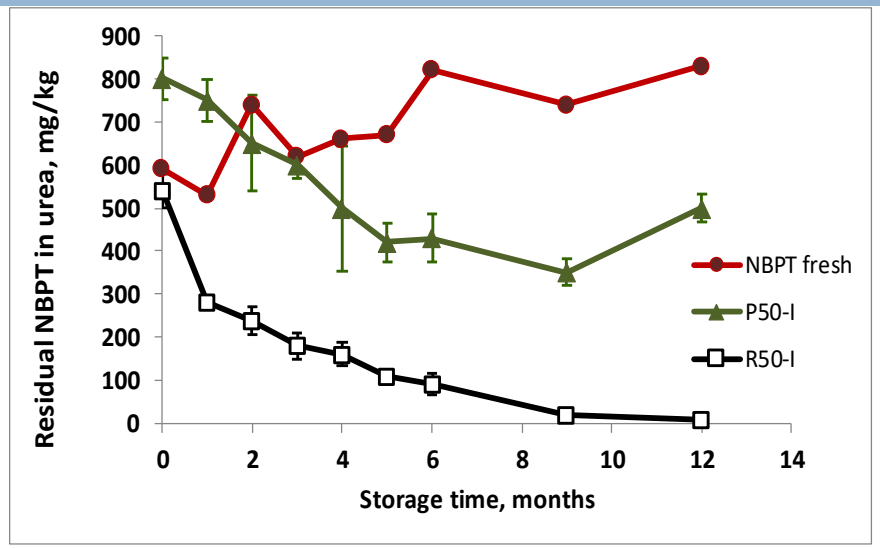
Material and Methods

Rondonónolis: Jan (21-32°C; x=26°C
Jul (14-30°C; x=22°C
Paranaguá: Jan (21-29°C; x=25°C
Jul (14-21°C; x=17°C)

- ✓ Urea+NBPT (870 mg NBPT/kg) stored for up to 1 year in sealed plastic bags: 500 g, 50 kg, and 750 kg (big-bags). 3 reps
- ✓ Stored in warehouses in two locations in Brazil: see map
- ✓ Sampling intervals: 1, 2, 3, 4, 5, 6, 9 and 12 months of storage
- ✓ Urea analyzed for residual NBPT and lab experiment to measure NH_3 volatilization. Red Latosol typical of Brazil (pH $CaCl_2$ 5.5, clay: 37%)
- ✓ Controls: untreated urea and urea freshly treated with NBPT

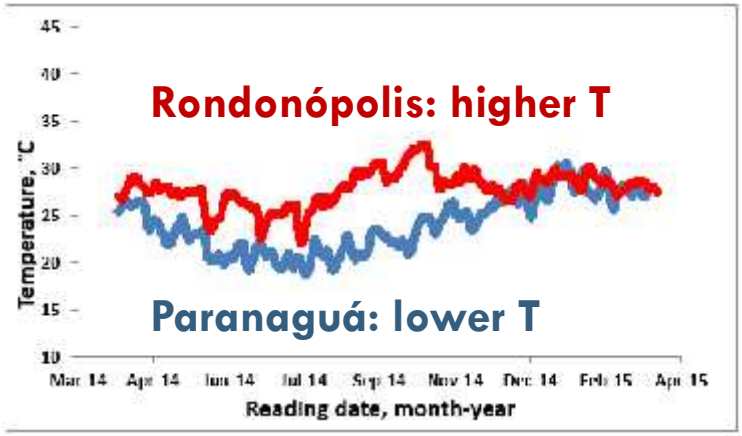
Results





NH_3 losses and residual NBPT in urea with/without NPBP samples as a function of site and storage time (50 kg bags). P: Paranaguá; R: Rondonópolis. Bars: standard deviation.

- Residual NBPT declines with storage time
- Paranaguá (mild): NH_3 losses with UR+NBPT similar to fresh NBPT
- **Rondonópolis (hot): shelf life declined after 6 months**



Conclusions

- ✓ Residual NBPT declined with storage time.
- ✓ Paranaguá: under similar conditions: shelf-life (SL) 9-12 months
- ✓ Storage at a high T (Rondonópolis) caused rapid degradation of NBPT treated urea: SL ≤ 6 months
- ✓ Higher rate of NBPT in places with high T (tropical climate) may be an alternative to prolong the shelf-life
- ✓ Safer to restrict storage time in hot places

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