# The Agronomic Properties of a Newly Developed Fused Ammonium Sulfate Nitrate (Sulf-N26) for Crop Production: Preliminary Results

**S. H. Chien* (Retired), Formerly with International Fertilizer Development Center (IFDC), Muscle Shoals, AL, USA**

**U. Singh, IFDC, Muscle Shoals, AL, USA**

**M. M. Gearhart, Honeywell International, McVeytown, PA, USA**

*** nchien@comcast.net**

# Introduction

- **Granulated or bulk-blended ammonium sulfate (AS) and ammonium nitrate (AN) has been used to provide N and S nutrients.**

- **However, there are two major problems:**

  **(1). The mixture can be explosive because of AN.**
  **(2). The mixture is not suitable for bulk-blending with urea because of caking problem caused by AN.**

- **Honeywell has patented a fusion process to produce fused ammonium sulfate nitrate (ASN), trade name "Sulf-N26", that avoids these two problems.**

- **A very important question that needs to be addressed:**

***Does the chemical process affect the agronomic properties of the fused ASN compared to the physically granulated ASN (or bulk-blended ASN)?***

- **The objective of this study was to compare $NH_3$ volatilization, leaching of N and S, and agronomic effectiveness of the fused ASN compared to that of the granulated ASN. Other N and S sources were also included in the study.**

# Materials and Methods

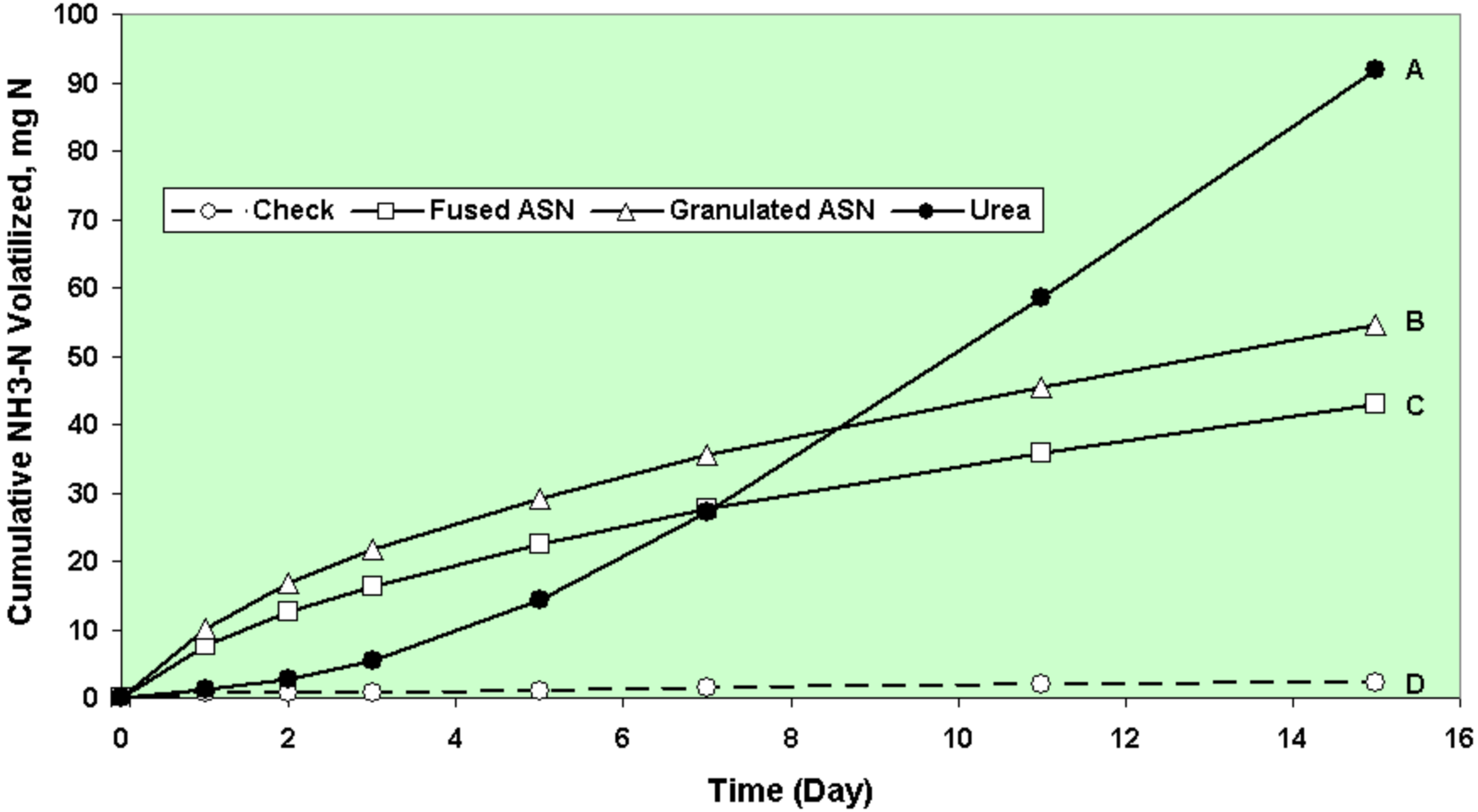
- **Granulated ASN was produced by mixing 62% of AS and 38% of AN followed by compaction to simulate the chemical composition of fused ASN having about the same granule size.**

- **Fused ASN contains 70% (by weight) of 2:1 AN:AS double salt and 30% of free AS. The XRD patterns of 2:1 double salt differs from that of AS and AN.**

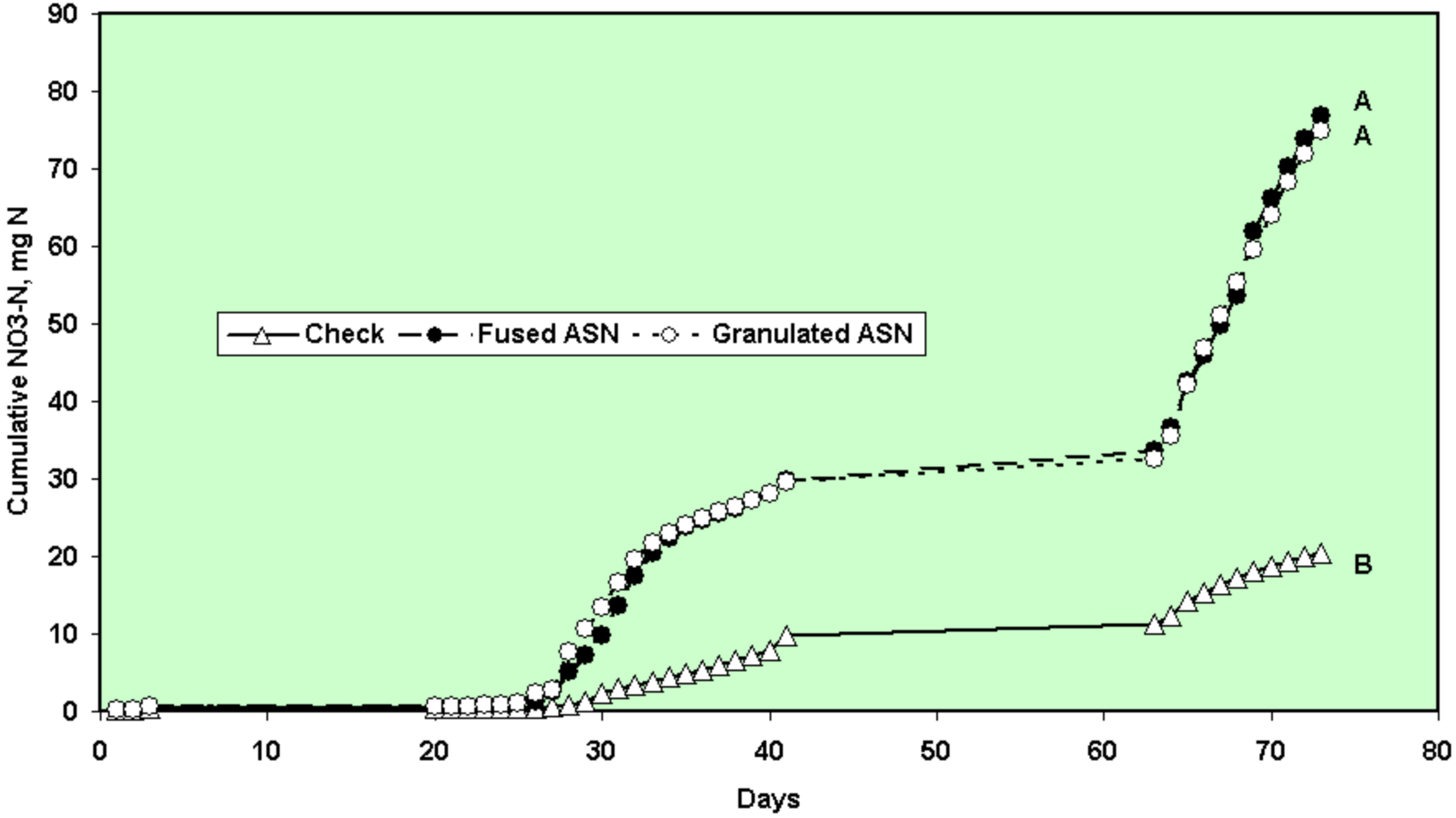
# Chemical Composition of Fused ASN and Granulated ASN

| Product | Total N (%) | $NH_4$-N (%) | $NO_3$-N (%) | Total S (%) | $SO_4$-S (%) |
|---|---|---|---|---|---|
| Fused ASN | 26.2 | 19.3 | 6.39 | 14.8 | 15.2 |
| Granulated ASN | 26.0 | 19.3 | 6.00 | 15.4 | 15.6 |

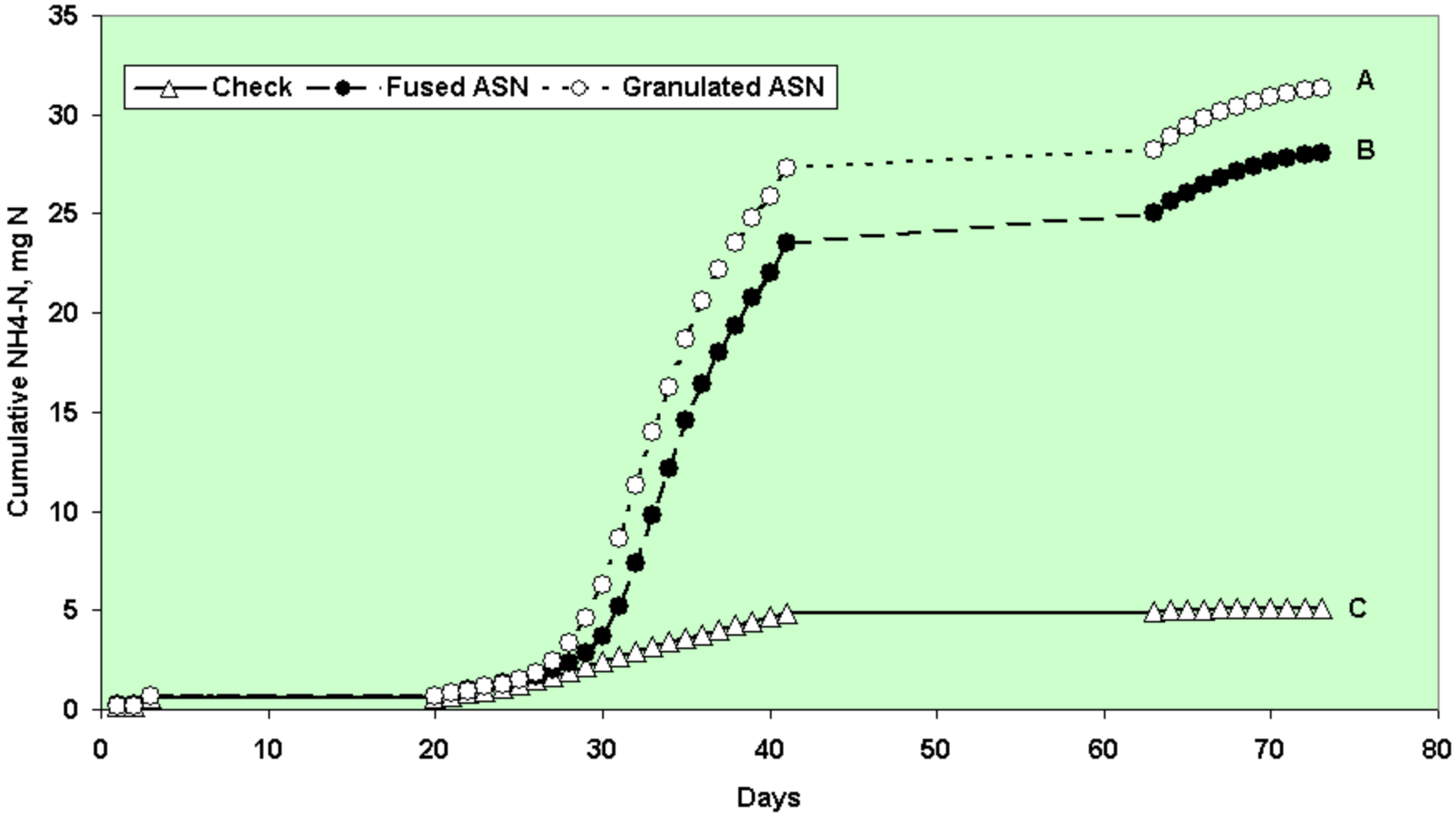
# Ammonia Volatilization on Calcareous Soil (pH 7.8)



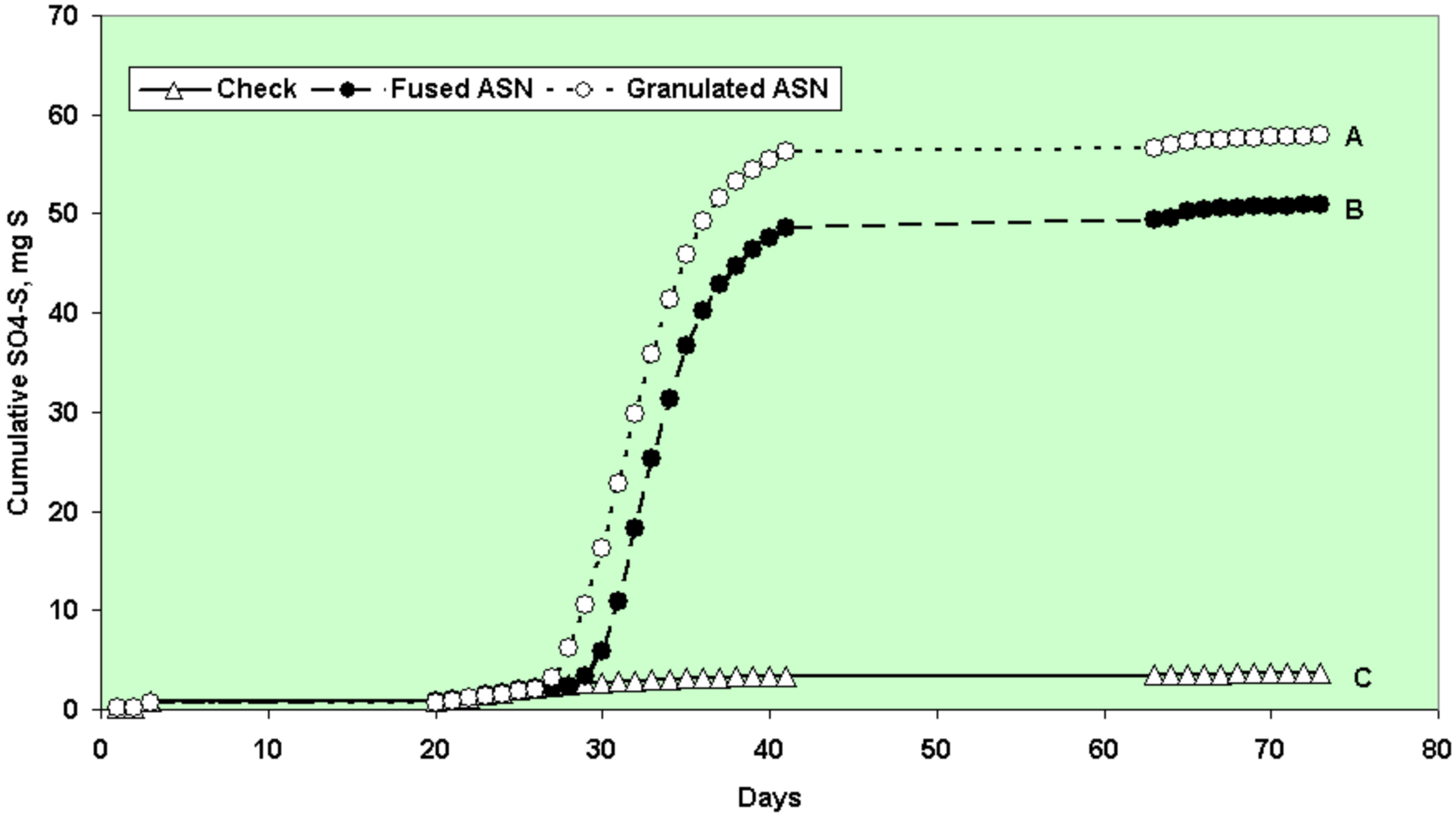
# Leaching of NO3-N in Sandy Soil (pH 5.3)



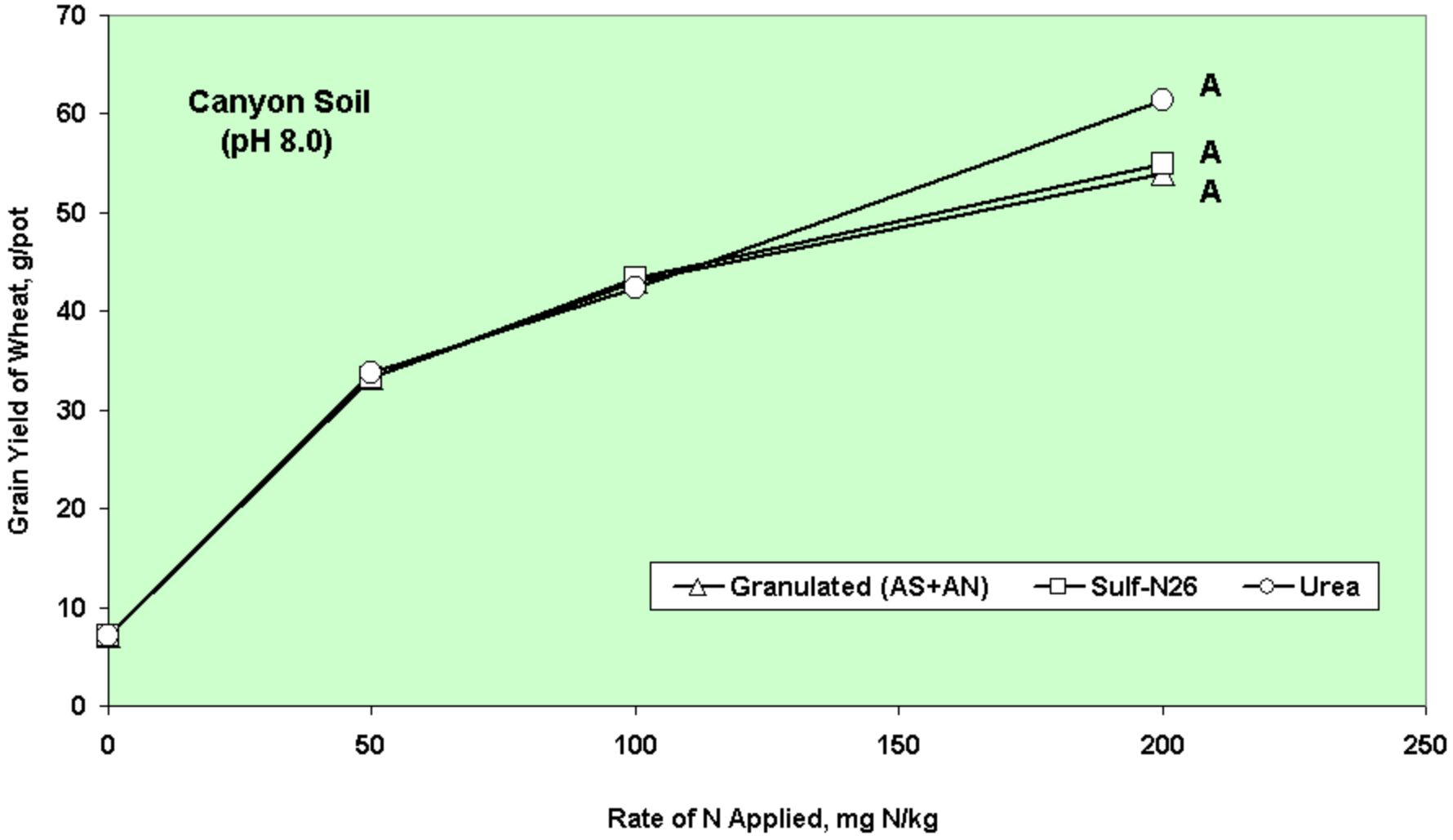
# Leaching of NH4-N in Sandy Soil (pH 5.3)



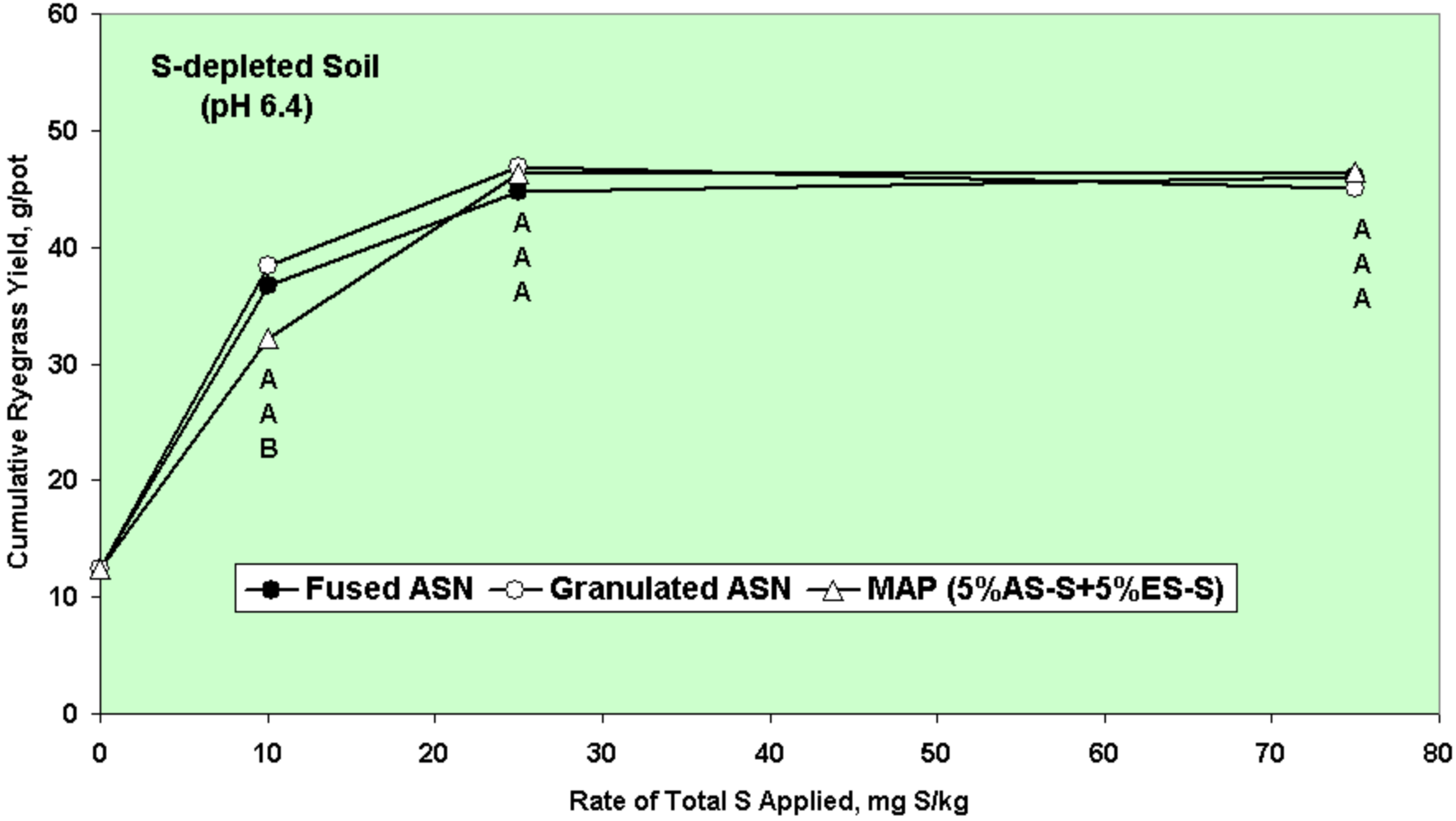
# Leaching of SO4-S in Sandy Soil (pH 5.3)



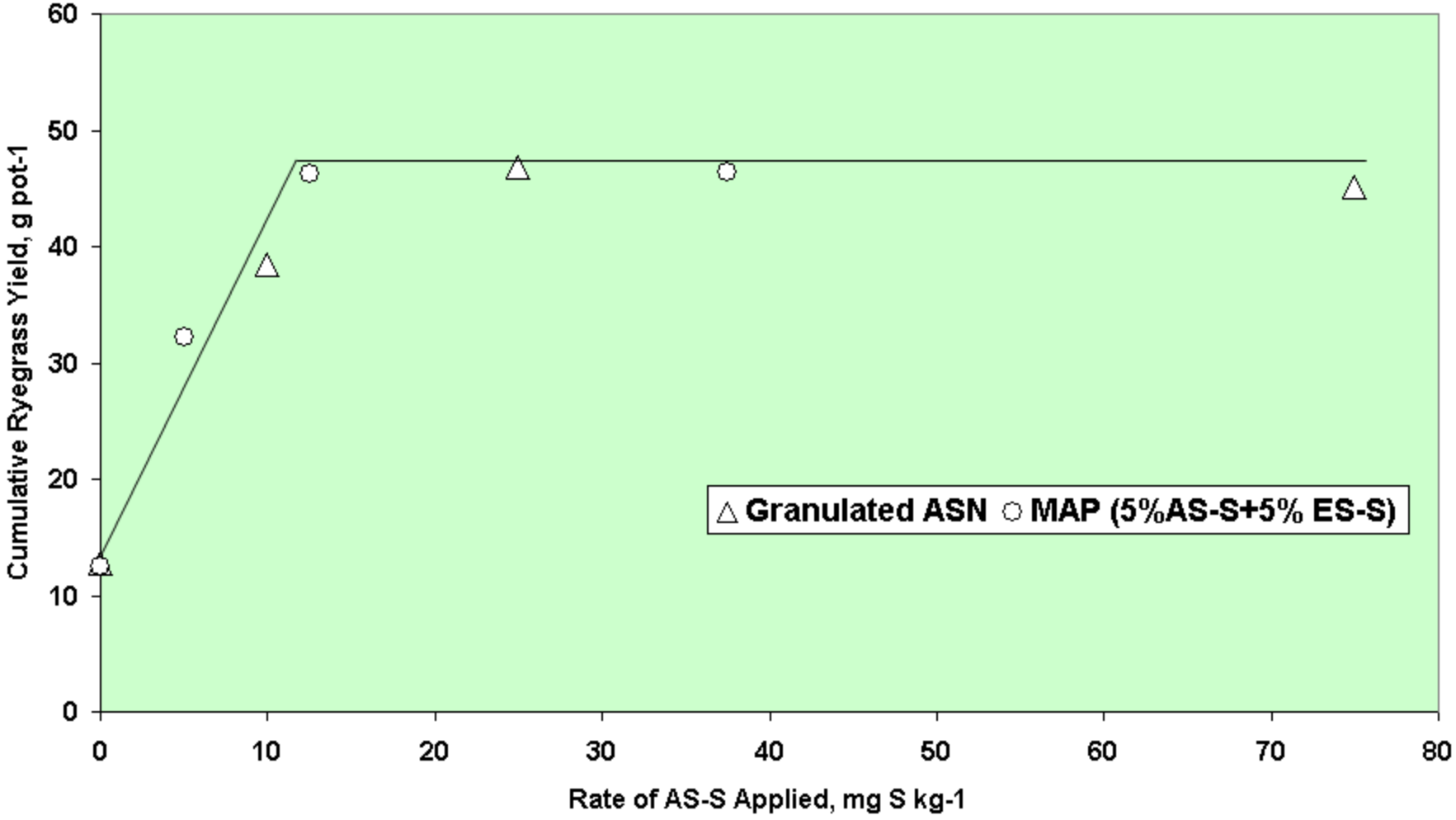
# Wheat Grain Yield



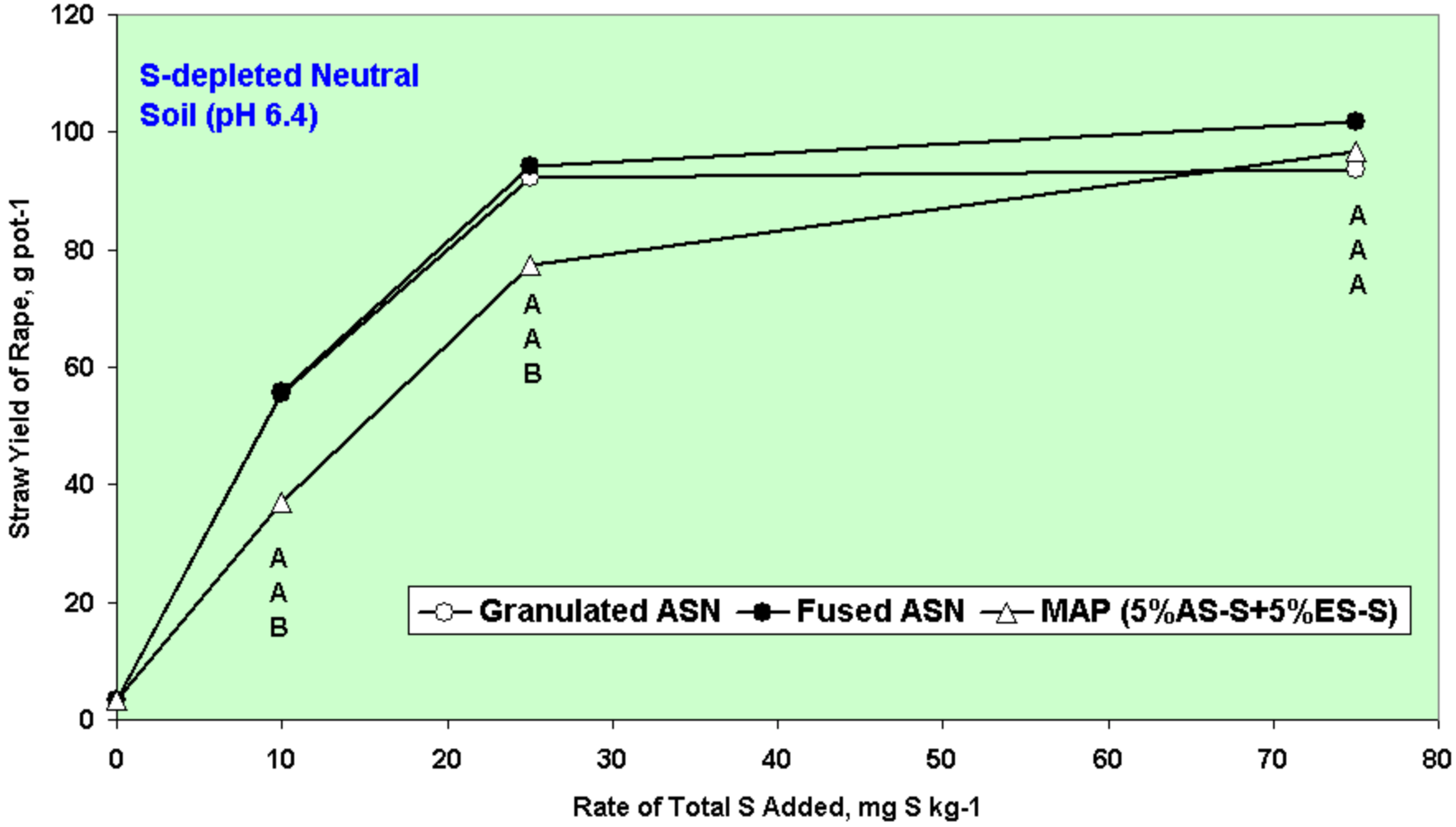
# Cumulative Ryegrass Yield



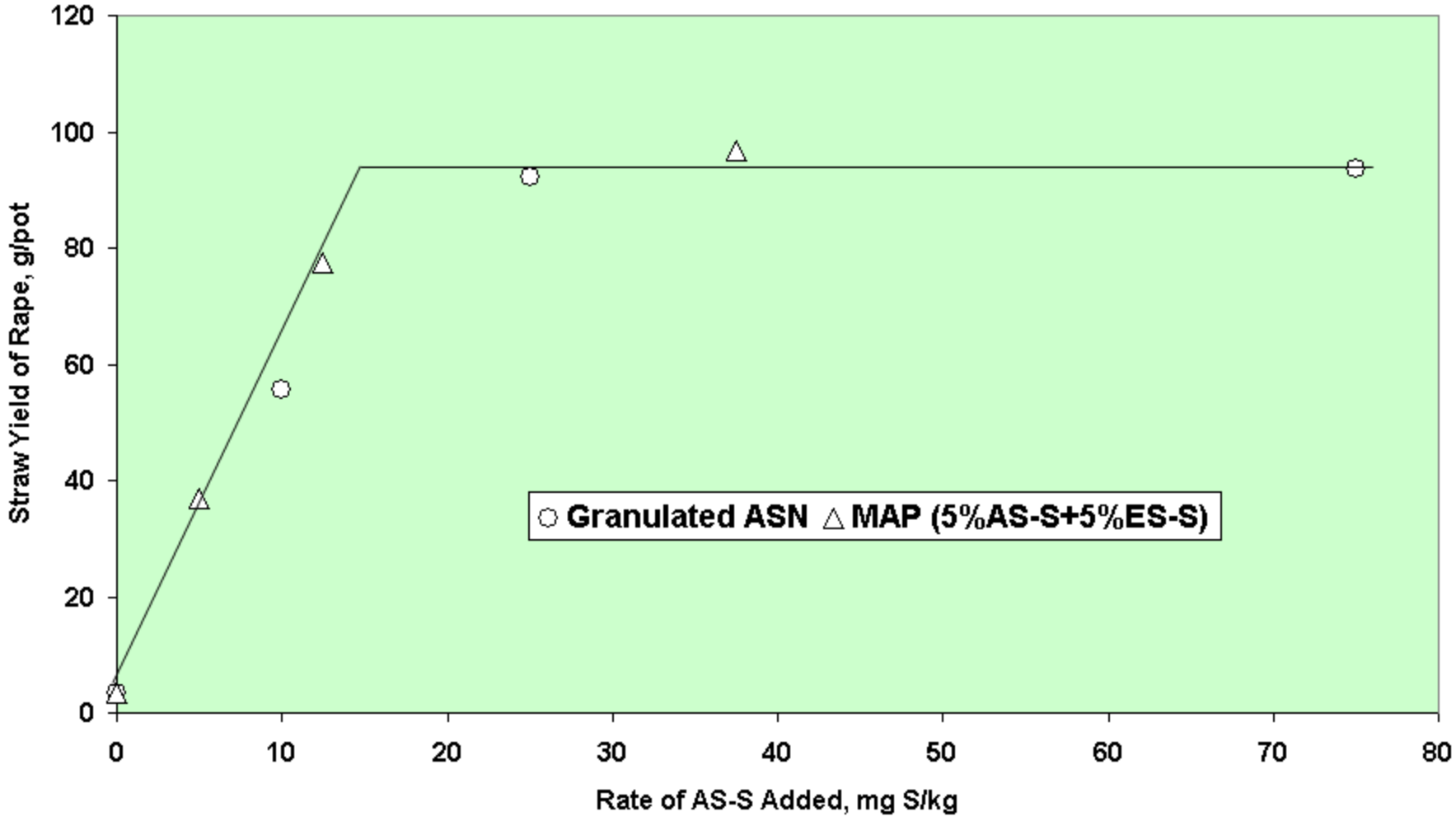
# Dry-Matter Yield of Ryegrass



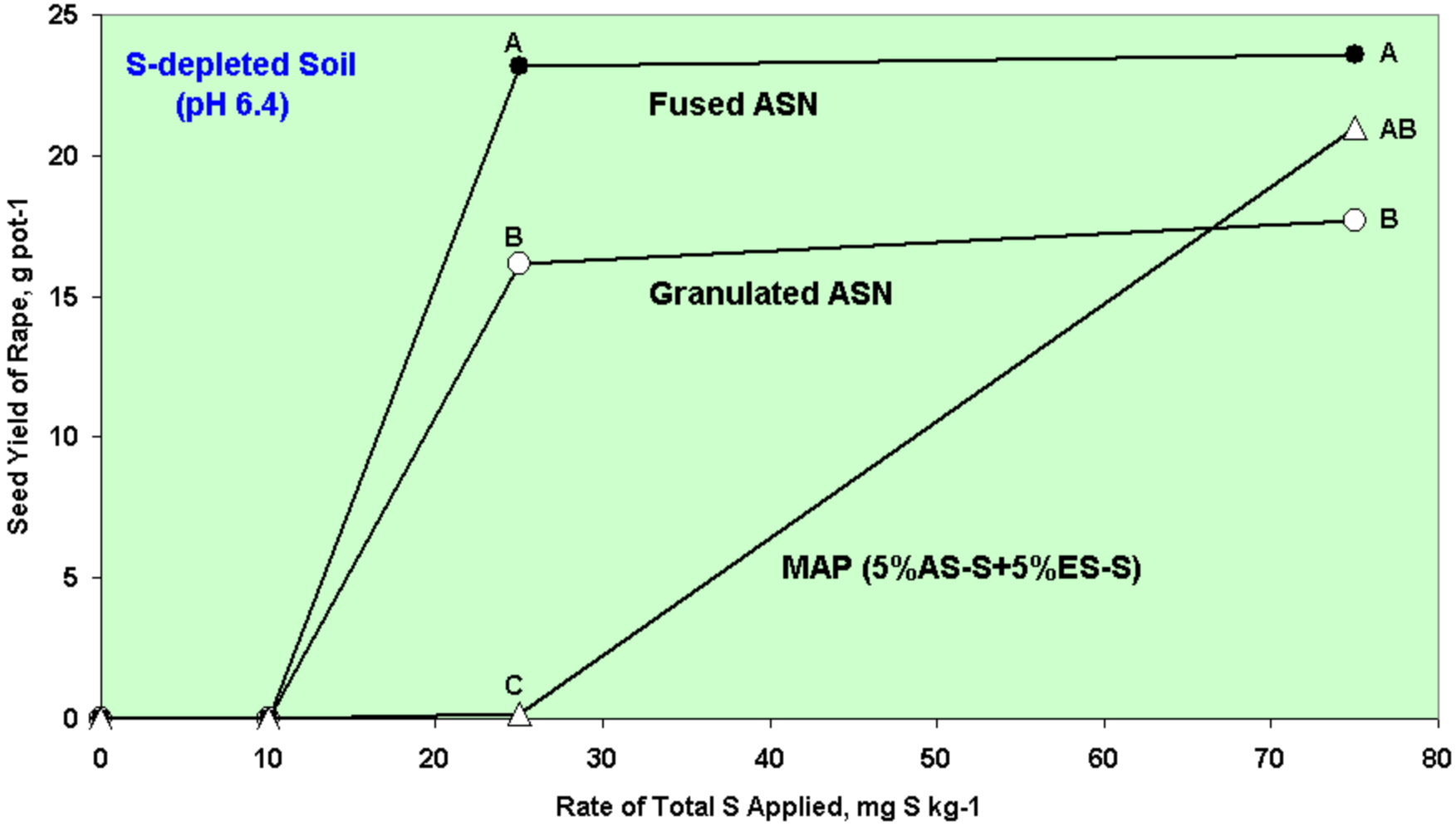
# Straw Yield of Canola



# Straw Yield of Canola



# Seed Yield of Canola



# Conclusions

- **$NH_3$ Volatilization on a calcareous soil and leaching of $NH_4$-N and $SO_4$-S (but not $NO_3$-N) in a sandy soil for the fused ASN were less than that for the granulated ASN. It appeared that release rates of $NH_4$-N and $SO_4$-S of ASN in soils were slow-down by the fusion process of ASN. Work is on-going to find the explanation.**

- **Fused ASN, granulated ASN, and urea were equally effective as N source in increasing wheat grain yield when incorporated.**

- **Fused ASN and granulated ASN were equally effective as S source in increasing cumulative ryegrass yield. Both were more effective than MAP (5%AS-S+5%ES-S).**

# Conclusions (cont'd)

- As S source for canola straw yield, fused ASN = granulated ASN > MAP (5%AS-S+5%ES-S).
- For canola seed yield, fused ASN > granulated ASN > MAP (5%AS-S+5%ES-S).
- ES-S of MAP granule did not contribute any available S to ryegrass and canola crops.
- On-going agronomic basic and applied research continues to study Sulf-N26 as compared to other N and/or S sources.