

Effect of Rhizobia Inoculants on Annual Medics

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Introduction

- Annual medics (*Medicago* spp.) have potential in the southern Great Plains:
 - to increase forage production/seasonal distribution and
 - to reduce need for N fertilizer, and
 - are well adapted to high soil pH.
- Information regarding appropriate inoculants is lacking.

Objective

- To determine the appropriate Rhizobia strains to maximize forage yield of seven annual medics



M. arabica (spotted burr medic)

M. polymorpha (burr medic)

Materials and Methods

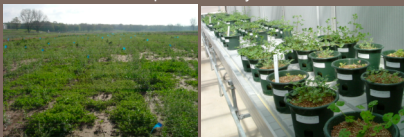
- Field experiment (RCBD with four replications), two years (2005-07)
- Greenhouse experiment (RCBD with three replications)
- Seven medic species

M. orbicularis var. *Estes* (burr medic), *M. polymorpha* var. *Ueckert* (burr medic), *M. minima* var. *Devine* (little burr medic), *M. rigidula* (PI 495552), *M. rigiduloides* (PI 227850), *M. arabica* (spotted burr medic) and *M. lupulina* var. *BEBLK* (black medic)

- Six Rhizobia strains
M 2, M 49, WSM 1115, Nitragin N, Nitragin A and Becker Underwood alfalfa (BU alf)
- An untreated control

- Seeds were inoculated prior to planting.
- Data recorded for nodule color and number, and dry weight:
At field, 110, 150 and 200 days after emergence (DAE)
At greenhouse, 35 DAE

Experimental layout



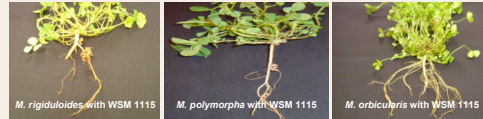
Field

Greenhouse

Results and Discussion

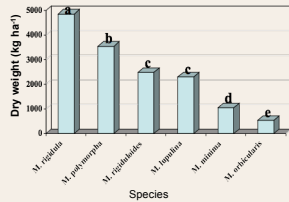
Field Study

Effect of inoculants on nodulation of different medics



Little nodulation was only observed for *M. rigiduloides*, *M. polymorpha* and *M. orbicularis* at 200 DAE.

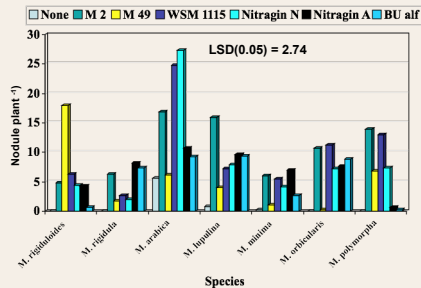
Dry matter yield of *Medicago* spp. in 2006



- No difference was observed in yields or nodule counts between inoculants at 110, 150 and 200 DAE for all species.
- Species were different in yield potential in both 2006 and 2007 (data not shown).
- Inoculum study seems not suitable to field conditions.

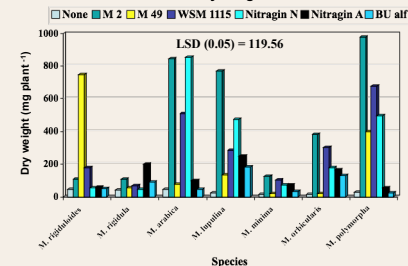
Greenhouse Study

Effect of inoculants on nodulation of different medics



Significant variation was observed between inoculants within the species.

Effect of inoculants on dry weight of different medics



Significant variation was observed between inoculants within the species.

Effect of inoculants on *M. rigiduloides*



Effective strain – M 49

Effect of inoculants on *M. minima*



Effective strain – M 2, WSM 1115, Nitragin N, Nitragin A

Effect of inoculants on *M. rigidula*



Effective strain – Nitragin A, BU alf

Effect of inoculants on *M. arabica*



Effective strain – M 2, WSM 1115, Nitragin N

Effect of inoculants on *M. polymorpha*



Effective strain – M 2, M 49, WSM 1115, Nitragin N

Effect of inoculants on *M. lupulina*



Effective strain – M 2, Nitragin N, M 49, WSM 1115

Effect of inoculants on *M. orbicularis*



Effective strain – M 2, WSM 1115, Nitragin N

Conclusions

- Medics should be inoculated with specific inoculums, e.g.:
 - *M. rigiduloides* – M 49 strain;
 - *M. rigidula* – Nitragin A (alfalfa strain);
 - *M. lupulina* – M 2 and Nitragin N strains; and
 - *M. polymorpha*, *M. orbicularis*, *M. minima* and *M. arabica* – M 2, WSM 1115 and Nitragin N strains.
- It is not recommended to conduct field studies on medics' inoculation because
 - adverse weather may kill Rhizobia bacteria and
 - there is chance of contamination.

Future Research



- Evaluate for:
 - Forage yield
 - Grazing performance
 - Compatibility with grass
 - Soil pH response
 - Seed yield
 - Seed harvest

- Based on plant vigor, nodule color and number, and dry weight, it appears that:
 - M 49 is the only and best strain for *M. rigiduloides*
 - Nitragin A and BU alf are moderately effective for *M. rigidula*
 - Nitragin N, WSM 1115, and M 2 are effective for *M. arabica*
 - Nitragin N, WSM 1115, and M 2 are very effective for *M. orbicularis*
 - M 2, WSM 1115, Nitragin N, and M 49 are effective for *M. polymorpha*
 - M 2 and Nitragin N are effective for *M. lupulina*
 - M 2, WSM 1115, Nitragin N, and Nitragin A are moderately to very effective for *M. minima*
- It is noted that some of the bacterial inoculants can nodulate but they are not effective in fixing N with the indication of white color nodules