

**EFFECTS OF LEGUME, MOLASSES AND UREA INCLUSION ON THE  
QUALITY OF DWARF NAPIER AND KING GRASS SILAGES**

**By**

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**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in  
Fulfilment of the Requirements for the Degree of Master of Science**

**August 2004**

**Dedicated to :**

**My father and mother : Selaman and Halimah**

**Husband : Mohd. Radzuan**

**Son : Muhamad Syafiq**

**Sisters : Onni Suhaiza  
Salmiah  
Hamsiah**

**Aunty : Sa'adiyah  
Zainab  
Habsah**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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**August 2004**

**Chairman: Associate Professor Mohd. Ridzwan Bin Abdul Halim, PhD**

**Faculty: Agriculture**

Silages were prepared from tropical grasses; king grass (*Pennisetum purpureum* x *P.typhoides*) and dwarf napier (*Pennisetum purpureum*) either alone or with the addition of gliricidia (*Gliricidia sepium*) and leucaena (*Leucaena leucocephala*). Other treatments include the addition of urea (3 %) and urea and molasses (3 and 10 %, respectively). The experiment was conducted to evaluate the effects of shrub legumes on the silage quality of tropical grasses and to compare them with the effects of additives such as urea and urea-molasses.

The results showed that the inclusion of both legumes increased dry matter percentage (from 15.7 % to 20.7 %) and crude protein (from 6.2 % to 9.0 %) contents of both silages. On the other hand, legume inclusion resulted in reduction of Neutral Detergent Fiber (from 69.1 % to 61.6 %), Acid Detergent Fiber (from 44.4 % to 38.6 %) and Acid Detergent Lignin contents (from 15.9 % to 15.5 %). The inclusion of urea decreased the dry matter percentage (from 15.7 % to 15.3 %) and increased the pH level (from 4.9 to

5.5) of both silages. In the meantime, the inclusion of urea-molasses increased the dry matter percentage (from 15.7 % to 20.7 %) of both silages. Silage made from dwarf napier with the inclusion of legumes had lower NDF and ADF content and higher dry matter percentage and crude protein content than that of king grass of similar treatment.

Despite improvement in quality with legume inclusion on most of the silage characteristics (low NDF, ADF, ADL and high dry matter, crude protein), lactic acid content did not increase. The inclusion of urea and urea-molasses also did not increase the lactic acid content. The experiment also showed that there were no significant effects between treatments in buffering capacity. However, between both legumes, the buffering capacity of silage with leucaena was significantly ( $P < 0.05$ ) higher than silage with gliricidia.

*In situ* digestibility studies indicated that the potential degradability of king grass with the inclusion of legumes (gliricidia and leucaena) was higher (69.6 % and 66.2 %, respectively) when compared with solely grass (59.5 %). The inclusion of both legumes to dwarf napier also increased (74.8 % and 71.1 % for gliricidia and leucaena, respectively) the potential degradability.

In conclusion, legume inclusion to king grass and dwarf napier improved nutritive value of the silages.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KESAN PENAMBAHAN KEKACANG, MOLASSES DAN UREA KE ATAS  
KUALITI SILAJ DWARF NAPIER DAN KING GRASS**

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Silaj telah diperbuat daripada rumput tropika king grass (*Pennisetum purpureum* x *P.typhoides*) dan dwarf napier (*Pennisetum purpureum*) secara tunggal dan dengan penambahan gliricidia (*Gliricidia sepium*) dan leucaena (*Leucaena leucocephala*). Rawatan lain termasuk penambahan urea (3 %) dan urea dan molasses (masing-masing 3 and 10 %). Kajian ini dijalankan untuk menilai kesan penambahan kekacang terhadap kualiti silaj rumput tropika dan membandingkannya dengan kesan penambahan aditif seperti urea dan urea-molasses.

Keputusan menunjukkan bahawa penambahan dua jenis kekacang meningkatkan peratus kandungan berat kering (dari 15.7 % ke 20.7 %) dan protein kasar (dari 6.2 % ke 9.0 %) ke atas kedua-dua silaj. Sebaliknya, penambahan kekacang menyebabkan pengurangan kandungan 'Neutral Detergent Fiber' (dari 69.1 % ke 61.6 %), 'Acid Detergent Fiber' (dari 44.4 % ke 38.6 %) dan 'Acid Detergent Lignin' (dari 15.9 % ke 15.5 %). Penambahan urea mengurangkan peratus kandungan berat kering (dari 15.7 % ke 15.3

%) dan meningkatkan tahap pH (dari 4.9 ke 5.5) ke atas kedua-dua silaj. Manakala, penambahan urea-molas meningkatkan peratus berat kering (dari 15.7 % ke 20.7 %) ke atas kedua-dua silaj. Silaj yang diperbuat daripada dwarf napier dengan penambahan kekacang mempunyai kandungan NDF dan ADF yang rendah dan peratus kandungan berat kering, protein kasar yang tinggi daripada silaj yang diperbuat daripada king grass dengan rawatan yang sama.

Walaupun terdapat peningkatan di dalam kualiti dengan penambahan kekacang ke atas kebanyakan ciri-ciri silaj (NDF, ADF, ADL yang rendah dan berat kering, protein kasar yang tinggi), tetapi kandungan asid laktik tidak meningkat. Penambahan urea dan urea-molas juga tidak meningkatkan kandungan asid laktik. Keputusan juga menunjukkan bahawa tiada kesan yang bererti diantara rawatan bagi 'buffering capacity'. Walau bagaimanapun, diantara dua jenis kekacang, 'buffering capacity' bagi silaj dengan leucaena adalah lebih tinggi ( $P < 0.05$ ) dari silaj dengan gliricidia.

Kajian terhadap kadar pencernaan menggunakan kaedah *in situ* menunjukkan bahawa potensi kebolehceraan king grass dengan penambahan kekacang (gliricidia dan leucaena) meningkat (masing-masing 69.6 % dan 66.2 %) apabila dibandingkan dengan rumput sahaja (59.5 %). Penambahan kedua-dua kekacang kepada dwarf napier juga meningkatkan potensi kebolehceraan (74.8 % dan 71.1 % untuk masing-masing gliricidia dan leucaena).

Kesimpulannya, penambahan kekacang terhadap king grass dan dwarf napier dapat mempertingkatkan khasiat silaj yang diperbuat daripada rumput.

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I certify that an Examination Committee met on 17 August 2004 to conduct the final examination of Masturi Binti Selaman on her Master of Science thesis entitled “Effects of Legume, Molasses and Urea Inclusion on The Quality of Dwarf Napier and King Grass Silages” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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## **DECLARATION**

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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