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**EVALUATION OF FORAGE YIELD AND QUALITY OF
SORGHUM, SUDANGRASS AND PEARL MILLET
CULTIVARS IN MANAWATU**

DAVISON SILUNGWE

2011

**EVALUATION OF FORAGE YIELD AND QUALITY OF
SORGHUM, SUDANGRASS AND PEARL MILLET
CULTIVARS IN MANAWATU**

A thesis presented in partial fulfilment of the requirements

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DAVISON SILUNGWE

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Abstract

Sorghum, sudangrass and pearl millet are versatile summer forages which are able to be grazed or conserved as silage; however there is little recently published information on the performance of these crops in New Zealand. A trial was carried out at Massey University, Palmerston North, in order to compare forage yields, forage quality, crop morphology and seed quality of four sorghum x sudangrass hybrids (Pac 8421, Pac 8423, Pacific BMR and Bettagraze), two sudangrass (Superdan 2 and Sprint), one sweet sorghum (Sugargraze); and one pearl millet (Nutrifeed) cultivars, sown on the 8 and 21 December 2009. Two harvests were taken at approximately 100 cm plant height, leaving a residual of 15 cm. Nutritive values of the whole plant: crude protein (CP), neutral detergent fibre (NDF), acid detergent fibre (ADF), metabolisable energy (ME), and soluble sugars and starch (SSS) were determined, using near infrared reflectance (NIR). Accelerating ageing was used to assess seed vigour.

Yields were significantly ($P = 0.005$) affected by plant date; mean yield for the 2nd plant date (11,356 kg DM/ha) was significantly lower than the 1st, (12,792 kg DM/ha). Pac 8423 (13,953 kg DM/ha), Sugargraze (13,262 kg DM/ha), Bettagraze (12,704 kg DM/ha) and Sprint (12,426 kg DM/ha), were the highest yielding group. There was a significant interaction ($P < 0.0001$) between sowing date and cultivar, for yield at the second harvest; cultivar differences for the first sowing date were larger than that for the second, which suffered more from cool autumn temperatures.

Crude protein ranged from 10.3 to 18%, NDF 57.2 to 65.2%, ADF 32.9 to 35.5%, ME 10.1 to 11 MJ/kg DM and SSS 1.2 to 13.9%. CP and ME were negatively associated with plant height and yield, whilst CP was strongly and positively related to ME.

Despite late sowing, most cultivars achieved high yields of relatively high quality forage. Significant differences amongst cultivars were observed. New cultivars displayed the potential to increase forage yield.

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List of Abbreviations

AA	accelerated ageing
ADF	acid detergent fibre
AOAC	Association of Official Analytical
ATP	adenosine triphosphate
BMR	brown mid rib
BMR	brown mid rib
°C	degree Celsius
Ca	calcium
cm	centimetres
CP	crude protein
DM	dry matter
DMD	dry matter digestibility
FAO	Food and Agriculture Organisation
g	gram
GLM	general linear model
ha	hectare
HCN	hydrogen cyanide
HCN-p	hydrogen cyanide potential
HG	hydrocyanic glycosides
ICP-OES	inductively coupled plasma optical emission spectrometry
IVDMD	in vitro dry matter digestibility
Kg	kilogram
LSD	least significant difference
MAF	Ministry of Agriculture and Forestry
ME	metabolisable energy
Mg	magnesium
mg	milligram
MJ	megajoules
mm	millimetres
N	nitrogen
Na	Sodium

NDF	neutral detergent fibre
NIR	near infrared spectrometry
NZ	New Zealand
NZMS	New Zealand Meteorological Service
P	phosphorus
PCRU	pasture and crop research unit
PH	plant height
RNA	ribonucleic acid
RUE	radiation use efficiency
SNZ	Statistics New Zealand
SSS	soluble sugars and starch
TT	thermal time
USA	United States of America
WU	water use