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NITROGEN TRANSFER FROM COWPEAS, ALYCECLOVER AND PARTRIDGE PEA

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Background. Positive benefits of growing legumes with non-legumes have long been noted. Benefits have included increased yield and/or quality of the associated non-legume. However, the extent of direct and indirect N transfer varies for different species of legumes and has been demonstrated to be site specific.

Research Findings. The stable isotope ^{15}N was used in a glasshouse trial to determine the extent of direct N transfer during the growing phase of selected legumes and 'Tifleaf' pearl millet. Pearl millet was either grown alone or in association with either 'Iron & Clay' cowpeas, common alyceclover (*Alysicarpus vaginalis*), or 'Comanche' partridge pea (*Cassia fasciculata*). Pearl millet grown alone was either fertilized with 100 lbs N/ac or received no nitrogen fertilizer. A total of 4 plants per pot was used to quantify N transfer, yield, and quality attributes. Soil material was amended for P, K, and micronutrients. Total N was highest for fertilized millet, but the millet + alyceclover produced the next highest amount of N. Nitrogen transfer as determined by the ^{15}N dilution technique indicated substantial amounts of N were directly transferred to pearl millet during the growing phase of the legume (Table 1). Alyceclover transferred the most nitrogen and contributed 63% of the total N contained in the pearl millet tissue.

Table 1. Apparent N transfer to pearl millet.

Treatment	% ^{15}N excess	SE	% Transfer
Millet + no fertilizer	0.0013	0.0001	N/A
Millet + ^{15}N	0.3211	0.0107	N/A
Millet + cowpea	0.2192	0.0277	30
Millet + alyceclover	0.1172	0.0043	63
Millet + partridge pea	0.2111	0.0043	33
Millet + 100 lb N/ac	N/A	N/A	N/A

Aboveground dry matter (DM) production per millet plant grown with partridge pea was not different from millet receiving 100 lb/ac of fertilizer N (Table 2). Total DM production per pot was highest for the pearl millet + alyceclover, but not different from that of N-fertilized pearl millet.

Table 2. Dry matter production of pearl millet and associated legumes.

Treatment	Pearl Millet g/pot	SE	Millet + Legume g/pot	SE
Millet + no fertilizer	2.59 c	0.21	10.33 d	0.83
Millet + ^{15}N	3.06 bc	0.26	11.33 cd	0.71
Millet + cowpea	3.68 b	0.58	17.84 b	1.06
Millet + alyceclover	2.62 bc	0.43	22.12 a	1.46
Millet + partridge pea	4.99 a	0.39	13.71 c	0.95
Millet + 100 lb N/ac	5.12 a	0.01	20.47 a	0.93

Quality differences were detected in pearl millet due to treatment. Neutral detergent fiber (NDF) was highest in pearl millet receiving 100 lb/ac of fertilizer N and lowest in millet grown with alyceclover and partridge pea (Table 3). Acid detergent fiber (ADF) was lowest in fertilized millet. Further analysis indicated that fertilized millet was highest in hemicellulose (HEM) and lowest in cellulose (CEL). Lignin + ash was not different among treatments.

Table 3. Nutritive value of pearl millet as influenced by legume of N.

Treatment	NDF	ADF	HEM	CEL	Lig + Ash
	Percent of DM				
Millet + no fertilizer	44.4 b	27.3 a	17.2 b	26.1 ab	1.2 a
Millet + ^{15}N			N/A		
Millet + cowpea	44.8 b	28.1 a	16.7 b	25.4 bc	2.6 a
Millet + alyceclover	43.2 c	27.8 a	15.7 b	27.1 a	0.7 a
Millet + partridge pea	42.5 c	28.3 a	14.4 b	27.2 a	1.1 a
Millet + 100 lb N/ac	47.2 a	26.0 b	21.2 a	24.7 c	1.2 a

Application. Results of this glasshouse trial suggest that alyceclover may provide a sufficient amount of N transfer to an associated grass to alleviate the use of inorganic N fertilizer. Field trials are needed to confirm these preliminary glasshouse results. However, an adequate amount of field data from Overton and other locations have confirmed the adaptability of alyceclover in the humid southeast. Alyceclover has been shown to tolerate moderate, intermittent grazing by livestock as well as being a desirable forage for wildlife.