THE EFFECT OF LADINO CLOVER MIXTURE WITH SOME GRASSES ON DM YIELD, BOTANICAL COMPOSITION AND SEASONAL NITROGEN ACTIVITY

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ABSTRACT
The effect of ladino clover mixture with some grasses on DM production, botanical composition and seasonal nitrogen fixation activity was examined under field conditions in two consecutive years. Treatment consisted of a clover mixture with four grasses and a reference crop which was grass grown alone.

DM production of second year Perennial ryegrass, Tall fescue plus clover mixture was greater than plot growing grasses but almost the same as Timothy and Orchardgrass both with and without clover. Yield in the third year was higher than that of the clover mixture treatment. Ladino clover content was increased from 26% in 1992 to 40% in 1993. Nitrogen fixing activity was increased each year. Generally ARA was low in spring, became highest in summer and again decreased in autumn.

KEYWORDS
DM production, botanical composition, mixture, ARA, nitrogen fixing ability

INTRODUCTION
To produce enough roughage through hill pasture in Korea we must reclaim the mountainous area which occupies over 66% of the total area. The method of oversowing at pasture establishment is applied mainly because of the steep mountainous region. Grass production in hill pasture is influenced by fertilizer, especially by nitrogen. Clover plays an important role in supplying nitrogen through the process of symbiotic nitrogen and transfer of fixed N to associated grasses (West *et al*., 1989). A key limiting factor in herbage production from hill sward is often the supply of plant available nitrogen (N) which is slowly mineralized from the soil nitrogen pool (Munro, *et al*., 1973).

Information is needed on the potential contribution of clover to the N economy of upland pasture in the absence of N fertilizer application. This study was conducted to find out the effect of ladino clover mixture with some grasses on DM yield, botanical composition and seasonal nitrogen fixation activity.

MATERIALS AND METHODS
The field experiment was undertaken at a farmland in the central part of Korea. The site was sown in autumn, 1991. Mixtures were Perennial ryegrass (S-24), Tall Fescue (Fawn), Timothy (Clair) and Orchardgrass (Potomac) with Ladino clover (Regal). In addition there were grasses plot grown alone as a control (reference crop). The trial was a 3-replicate randomized block design.

The clover mixture plots had P and K, lime when seeding and no nitrogen. The control (grasses grown alone) got N-P-K of 240-200-280 kg/ha per year. Both swards were cut four times for two consecutive years from 1992 to 1993. DM production and botanical composition was measured and acetylene reduction activity (ARA) was also checked with root incubated in container for 2h. Gas samples were taken and analyzed for C_2H_2 content using GC fitted with a flame ionization detector (Marriott. C.A., 1988).

RESULTS AND DISCUSSION
There were large differences in total DM production in Perennial ryegrass plus Ladino clover and tall fescue plus Ladino clover over the non-clover plot, but production was almost the same in the timothy and orchardgrass plot with and without clover. Tall fescue had the highest DM production in 1992.

The reverse results were obtained in 1993. Grass grown alone (with N fertilizer) had a higher yield than clover mixture (with no N fertilizer). Tall fescue plots were had almost the same production between treatments. The main factor influencing DM production in both years was probably N fertilization. The pasture species in the second year was not affected by nitrogen because they were young, but, the third year clover mixture plots seemed to be deficient in nitrogen so that DM production were 52 to 60% lower than that of N fertilized plot except for the Tall fescue plots (Fig. 1). The Ladino clover mixture yielded four times more than without N application. Jung *et al*. (1982) reported almost same four times more yield than the control (no N application) from hill oversown pasture.

Table 1 shows the botanical composition of each mixture in 1992-1992. Ladino clover content of Orchardgrass + Ladino clover plot had very yield low compared to the other three treatments which ranged from 261 to 28.8% in 1992. There was a substantial increase of clover botanical composition at the final cut in 1993.

Ledgard *et al*., (1987) reported that the differences in plant species composition and production are a product of soil and environmental factors. They had no N fertilizer application in mixture plot but instead four cut each year. So that clover might be dominant species at final year. The cover composition are somewhat higher that reported by Chung *et al*., (1982). The factor affecting clover composition was probably N deficiency in the soil.

Nitrogen fixing activity was low at the first harvest and rose apparently from June to August except for the Orchardgrass plus clover plot in 1992, but there was clearly a decrease in October. Acetylene reducing activity increased persistently from May to October other than the timothy mixture in 1993. As clover proportion became higher, the amount of ARA was increased in the second year. The results were different from Sugawara et al., (1995) who suggested 3 peaks during the growth period every year. In UK, maximum level of ARA were measured from May until mid July and it would appear to be important, therefore to maintain as high a Clover LAI as possible if high levels of ARA are to be achieved (Marriet, 1988).

REFERENCES
Jung, Y.K., S.K. Yun and J.G. Kim. 1982. Effects of Lime, Nitrogen, phosphorus, and potassium application rates on oversown mountain grassland. II Changes in the yield components, botanical composition, and rate of seeded herbages in mixed grass/clover sward. J. Korean soc of animal science: **24** (6): 499-503.

Sugawara, K. and T. Isawa. 1995. Seasonal variation of nitrogen fixation by in situ determination in white clover (Trifolium repens L.)-orchardgrass (Dactylis glomerata L.). Japanese Grassland Sci **41** (1): 67-70.

Ledgard, S.F., G.J. Brier and R.A. Littler. 1987. Legume production and nitrogen fixation in hill pasture communities. New Zealand Journal of Agricultural Research **30**: 413-421.

Marriot, C.A. 1988. Seasonal variation in white clover content and nitrogen fixing (acetylene reducing) activity in a cut upland sward. Grass and Forage Science **43**: 253-262.

Munro, J.M.M., D. A. Davies and T. A. Thomas. 1973. Potential production in the upland of Wales. 3. Soil nutrient resources and limitation. Journal of the British Grassland Society **28**: 247-255.

West, C.P., K.W. Steele and E. A. Halligan 1989. Competition effects on nitrogen fixation and mineral N uptake in *Trifolium Repens* L.-*Lolium Perenne* L. Proceedings of the XV IGC: 457-459.

Table 1
Botanical composition of each mixture at final harvest in 1992 and 1993

Year / Treatment	1992			1993		
	Grasses	Clover	Weeds	Grasses	Clover	Weeds
Pe+La	35.3	28.8	59.9	35.0	53.3	11.5
Fe+La	61.1	26.1	12.8	44.3	50.3	5.4
Ti+La	64.1	28.7	7.2	59.6	40.0	0.4
Or+La	82.7	7.3	10.0	35.5	57.8	6.8

Pe+La: Perennial ryegrass + Ladino clover
Fe+La: Tall fescue + Ladino clover
Ti+La: Timothy + Ladino clover

Figure 1
Comparison on DM yield of four different ladino clover mixtures and control plot in 1993

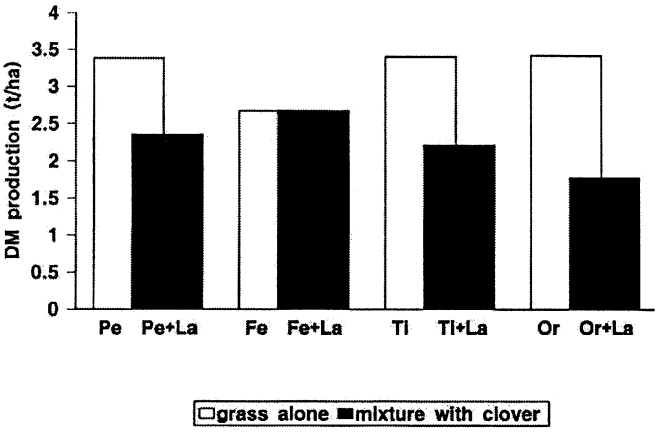
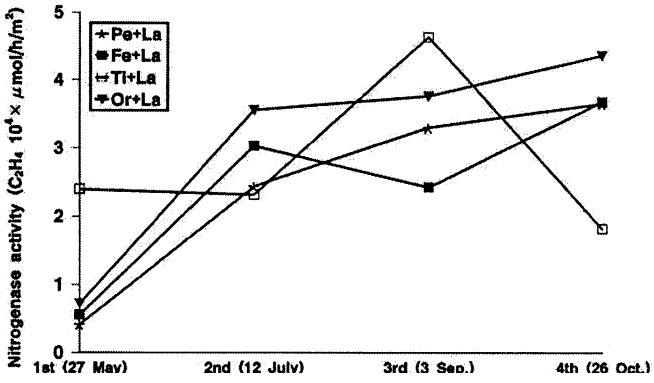


Figure 2
Change of nitrogen fixing (acetylene reducing) activity from spring to mid-autumn in 1993.



(Pe+La : Perennial ryegrass+Ladino, Fe+La : Tall fescue+Ladino
Ti+La : Timothy+Ladino, Or+La : Orchardgrass+Ladino)