

INFLUENCE OF DIFFERENT ROTATION SYSTEMS ON PLANT N UPTAKES AND SOIL ORGANIC MATTER CONTENTS UNDER LIGHT-TEXTURED SOIL CONDITIONS IN TURKEY

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Soils of Niğde Province are light-textured, poor in soil organic matter and structure, and thus have very high infiltration rates which lessens the efficient use of fertilizer and water [1]. Earlier reseaches in the area had shown that N and water use efficiencies of potato can be improved by 30 and 50 %, respectively, by using drip irrigation-fertigation instead of sprinkler irrigation [3]. The objectives of this research were to investigate the plant N uptake, moisture in soil profile and soil organic matter status under two rotation [Vetch-Potato-Wheat- Vetch-Potato (V-P-W-V-P) and Alfalfa-Alfalfa-Potato (A-A-P)] systems. Neutron probe, N_{15} labelled fertilizer were used in the experiments.

The values of nitrogen derived from air and soil (Ndfa and Ndfs, respectively) and the soil N were higher under A-A-P rotation then V-P-W-V-P rotation (Fig.1). This indicates at A-A-P rotation system can be more beneficial for the improvement of the soils at Niğde region. Soil moisture values at 0-90 cm depth were always higher for V-P-W-V-P rotation system then A-A-P rotation system which showed that with V-P-W-V-P rotation system more water in the soil profile can be stored.

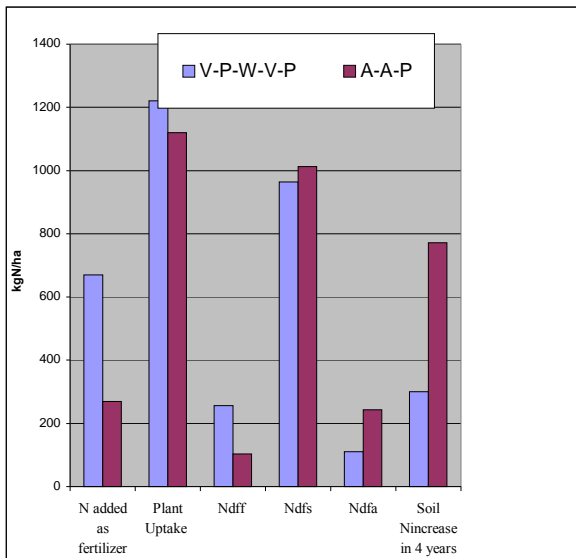


Fig.1. N balance in two rotation systems

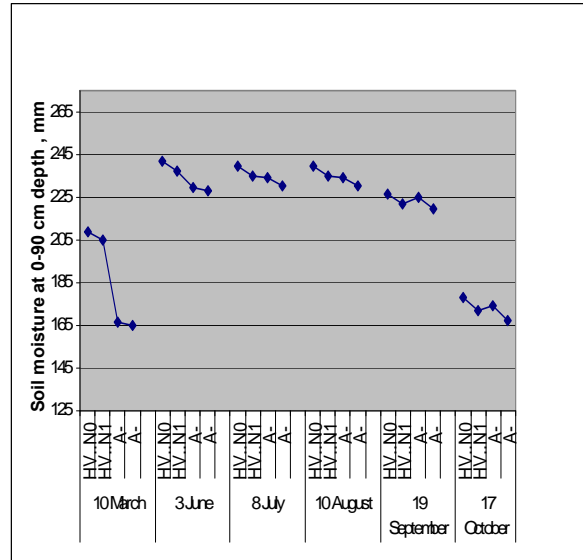


Fig.2. Moisture in soil profile for potato at two different N treatments under two different rotation systems

There were slight changes in soil organic matter contents under V-P-W-V-P rotation system, however, important increases were found in soil organic matter contents under A-A-P rotation system, especially for 30-60 and 60-90cm depths (Table 1). Alfalfa increased the amount of organic matter to 48560 kg/ha for N_0 and to 68530 kg/ha for N_1 at 0-90 cm depths. Most of this

increase was from 30-90cm depths. The results showed that alfalfa enhanced organic matter of the soil and vetch (green manure) is not effective for improving the organic matter content of the soil, because alfalfa had deeper roots and stayed 2 years, however, vetch was grown for short time as green manure. With the increase in organic matter the structure stability index was also increased under A-A-P rotation system.

Tab.1. Organic matter changes over time

	Depth, cm	V-P-W-V-P rotation		A-A-P rotation	
		October 2005	October 2008	October 2005	October 2008
N ₀	0-30	1.98	2.18	2.14	2.47
	30-60	1.31	1.52	1.09	1.25
	60-90	0.93	0.71	0.65	0.64
N ₁	0-30	2.48	2.64	2.20	2.24
	30-60	1.43	1.58	1.14	1.29
	60-90	0.78	0.63	0.80	0.91

Tab.2. Change of structure stability index for two treatments under two rotation systems

Treatment	Sampling time					
	1	2*	3	4	5*	6
H-P-W-H-P (N ₀)	39.28	39.87	37.63	37.59	41.10	37.00
H-P-W-H-P (N ₁)	38.74	42.37	41.09	41.53	44.10	40.17
	1	2*	3*	4*	5*	6*
A-A-P (N ₀)	38.64	42.77	41.30	42.58	45.03	41.34
A-A-P (N ₁)	38.06	38.94	40.76	42.23	43.08	40.44
For H-P-W-H-P			For A-A-P			
1) At the beginning (October 2005)			1) At the beginning (October 2005)			
2) After incorporating vetch to the soil (June 2006)			2) Alfalfa (June 2006)			
3) After potato harvest (October 2006)			3) Alfalfa (October 2006)			
4) After wheat harvest (September 2007)			4) Alfalfa (September 2007)			
5) After incorporating vetch and alfalfa to the soil (May 2008)			5) After incorporating vetch and alfalfa to the soil (May 2008)			
6) After potato harvest (October 2008)			6) After potato harvest (October 2008)			

*: Difference is significant (P<0.05) in respect of sampling time 1

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