

Nitrogen fertilization effect on biomass yield of six different *Sorghum bicolor* varieties

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Introduction

Various suitable systems are used for soil remediation or maintenance of soil's fertility as well as the increase of productivity, such as crop rotation with legumes, inoculated crops, co-crops, green or organic fertilizers, etc.

Sorghum belongs to the *Poaceae* family and it is one of the most significant cereals used for its high biomass production, as animal feed in the semi-arid, tropical regions due to its ability to grow at high temperatures and dry conditions in areas where no other crops can be grown. The yield of sorghum in Greece depends on the cultivated variety, the sowing season, the irrigation, the fertilization as well as the soil and climatic conditions of each area.

The aim of this study was to determine the most suitable variety of sorghum and the most effective nitrogen fertilization dose to improve the production of biomass in a field where the previous crop was the pea for silage production.

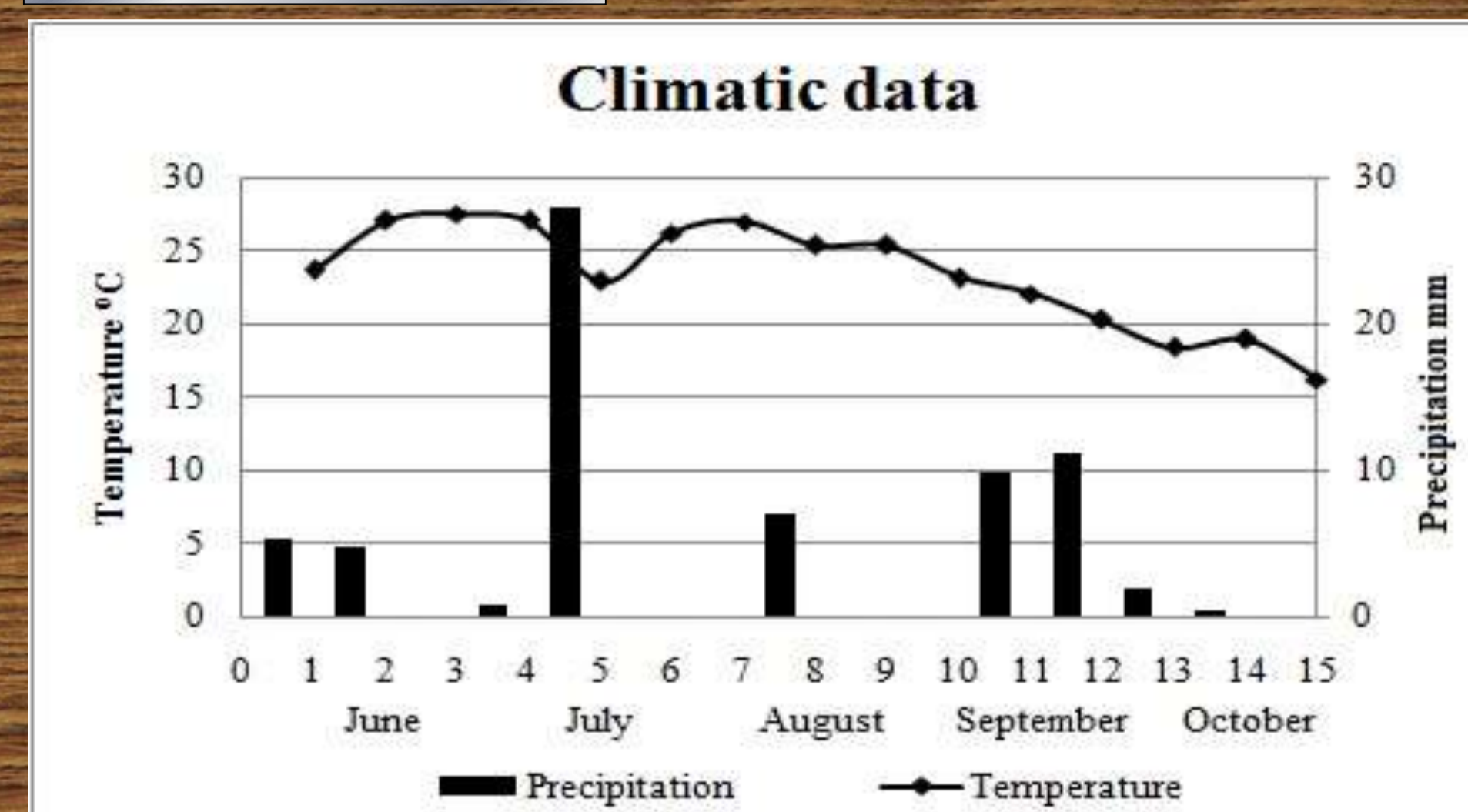
Material & Methods

A field experiment was conducted in a clayey soil with an alkaline reaction in both the surface and sub-surface soil horizon. It is particularly fertile with a percentage of organic matter of 2.91% at a depth of 0-30 cm and 1.86% at 30-60 cm.

A factorial split-plot design was used with three replicates (blocks) and twenty-four plots per replication. The main factor was the different varieties (V_1 : Buffalo grain, V_2 : Elite, V_3 : Big Kahuna, V_4 : 25K1009, V_5 : 4264 and V_6 : 5D61, six varieties in total) and the sub-factor the different nitrogen fertilization levels (N_1 : 0, N_2 : 80, N_3 : 160 and N_4 : 240 kg ha⁻¹, using urinary ammonia 40-0-0) with three replicates. Initially, pea was sown (11/21/2018, Olympus variety) with a quantity of 140 kg ha⁻¹. Pea biomass harvest took place on 5/29/2019, and thereafter the field was cultivated for the sowing of sorghum, which took place on 5/6/2019, in a plant distance of 50 cm between the lines (varieties V: 1-3) and 75 cm between the lines (V:4-6) while the plant distance on the line was 8 cm, for all varieties. The final harvest took place on October 25.

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Results



During summer months the average recorded air temperature was 25.8°C, which decreased by 4°C in September while the recorded precipitation for the summer months was only 46 mm of which 60% occurred in July.

Fresh biomass weight of "25K1009" was the higher, followed by "Big Kahuna" and "Elite" with 66.9, 65.27 and 63.03 t ha⁻¹ respectively, which are statistically significantly higher compared to the yield produced from the other three varieties.

The increase in nitrogen fertilization produced significant higher fresh biomass yield, following the principle: "the higher the nitrogen fertilization, the higher the production". Regarding the interactions of the factors, the highest yield in fresh and dry weight was achieved in the variety "25K1009" for the higher n-fertilization level.

"The higher the nitrogen application is, the higher the sorghum biomass yield is produced"
"A legume—cereal system could be introduced into cultivating systems as a second nitrogen supplier to subsequent crops."

		Fresh Biomass	Dry Biomass	
		t ha ⁻¹		
Varieties	Buffalo Grain	35.58	9.07	
	Elite	63.03	14.69	
	Big Kahuna	65.27	11.53	
	25K1009	66.90	16.15	
	4264	45.36	10.96	
	5D61	38.54	10.56	
LSD_{.05}		5.265	1.991	
N-fertilization	0	44.52	10.81	
	80	48.80	11.82	
	160	53.64	12.01	
	240	62.83	13.98	
	LSD_{.05}	4.439	1.275	
Interaction (Varieties X N-fertilization)	Buffalo Grain	0	32.40	8.84
		80	33.17	8.86
		160	36.63	8.76
		240	40.13	9.81
	Elite	0	60.30	15.43
		80	60.90	13.99
		160	62.17	14.18
		240	68.77	15.15
	Big Kahuna	0	54.40	9.79
		80	57.23	10.61
		160	66.90	11.67
		240	82.53	14.04
	25K1009	0	53.00	13.05
		80	62.85	16.51
		160	68.62	15.63
		240	83.12	19.44
	4264	0	32.25	7.83
		80	42.05	10.16
		160	48.05	11.58
		240	59.10	14.25
	5D61	0	34.80	9.89
		80	36.58	10.91
		160	39.47	10.23