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Title: Effects of Fertilization and Clipping of Phlomis fruticosa L. on a Phryganic Ecosystem: The Case of Thesprotia, Northwest Greece

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Abstract: This study examined the effectiveness of various shrub control treatments (N+P fertilization, clipping of Phlomis fruticosa and clipping combined with N+P fertilization), to reduce shrub cover and encourage the growth of palatable herbaceous vegetation. Dry matter production and Crude Protein (CP) content of palatable herbaceous vegetation were determined annually from 2004 to 2006. Experimental plots received rains of 691.7, 532.9 and 595.7 mm during the 3 study years compared to mean growing season rainfall of 486.6 mm. Forage production was increased significantly by clipping of Phlomis fruticosa (409.4 vs 335.5 g DM m- 2, $p<0.05$) and clipping combined with N+P fertilization (454.6 vs 335.5 g DM m- 2, $p<0.05$). On average over the 3 years, crude protein concentration increased by fertilization (9.18 vs 8.26%, $p<0.05$) and fertilization combined with clipping of Phlomis fruticosa (9.35 vs 8.26%, $p<0.05$). N and P fertilization combined with clipping of Phlomis fruticosa significantly ($p<0.05$) affected S-RUE. The highest S-RUE of 3.09 kg forage ha- 1 mm- 1 was obtained with N+P fertilization combined with clipping of Phlomis fruticosa. On average over the 3 years, nutrient use efficiency with N+P application combined with clipping of Phlomis fruticosa for all treatments was higher than without clipping. The increases in plant production per kg fertilizer applied, for N+P application both and without clipping of Phlomis fruticosa L. were 21.10 and 59.50 kg, respectively. Effective improvement of rangeland dominated by Phlomis fruticosa requires, most probably, a combined treatment including removal of mature Jerusalem sage shrubs, suppressing their recovery and stimulating the competing forage component. However, it is proposed the application of clipping of Phlomis fruticosa for a period of at least three years to avoid unfavourable environmental effects from fertilization.