Effect of Rate of Nitrogen Application upon a Sudan Grass Green Manure Crop and Its Influence upon the Yield and Nitrogen Requirement of Potatoes

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NONLEGUMES, particularly cereals, are frequently used in the irrigated sections of the West as green manure and cover crops. Since they are easily and cheaply established, they may have a place in fitting the desert soils of the Columbia Basin for crop production under irrigation.

These soils, generally coarse in texture and unaggregated, are inclined to blow when first plowed and leveled. Since they generally contain less than 1% organic matter and only 0.03 to 0.04% total nitrogen, growing a nonlegume and returning it to the soil may seriously reduce the nitrogen supplying power of the soil for the following crop.

This paper reports the results obtained in two field experiments on widely differing soils in which Sudan grass was grown with various rates of nitrogen fertilizer in the summer of 1946. The following spring the Sudan grass was plowed under and early potatoes were planted. Ammonium nitrate was applied to the potatoes at four rates on each of the nitrogen treatments previously applied to the Sudan grass.

One experiment was conducted at the Umatilla Field Station, Hermiston, Oreg. on virgin Ephrata loamy fine sand. The other was located on Ritzville very fine sandy loam at the Irrigation Experiment Station, Prosser, Wash.

Experiment on Ephrata Loamy Fine Sand

The virgin soil, covered with native grass, was irrigated, plowed shallow, harrowed, and leveled. Ammonium sulfate at four rates of application (Table 1) was broadcast on triplicated main plots, 40 by 55 feet, and plowed under. All plots received 100 pounds P₂O₅ (treble superphosphate) per acre before planting as 40-0, or 80-120, or root pruning were not apparent.

Nitrogen applied | Height | Oven-dry weight | Total nitrogen | Nitrogen recovery †
---|---|---|---|---
0 lbs./acre | 4.2 ft. | 3,240 lbs./acre | 0.46 | 15 lbs./acre | —
40 lbs./acre | 5.4 ft. | 5,920 lbs./acre | 0.54 | 32 lbs./acre | 42%
80 lbs./acre | 5.8 ft. | 6,300 lbs./acre | 0.74 | 47 lbs./acre | 40%
120 lbs./acre | 5.8 ft. | 6,240 lbs./acre | 1.04 | 65 lbs./acre | 42%
L.S.D.* | 0.9 ft. | 2,520 lbs./acre | 0.72 | — — |

*Least significant difference at p = .05.
†(total N—total N in check) / (total N in check) × 100

Potatoes emerged about April 6. By April 25, when the plants were large enough to fertilize, all of the plants were no apparent differences in potato yield could be correlated with the 1946 treatment of Sudan grass. On April 25, when the plants were 3 inches tall, each Sudan grass plot was ammonium nitrate side dressed 4 inches of each row and 2 inches deep with a belt-type fertilizer application at this time.

The Sudan grass was double disced and under about 7 inches deep on March 5. Certified White Rose potatoes, averaging 2 ounces in weight, were planted March 10, 10 inches apart in 33-inch rows with an assisted feed planter of fertilizer openers with Sudan grass fertilizer application at this time.

The Sudan grass was seeded June 27. When the seedlings were 3 inches high, nitrogen deficiency symptoms were clearly visible on plants in the check plots. All treatments were clearly apparent on differences in plant height or color. Plant heights, oven-dry weights, and total nitrogen contents of the tops were taken for oven-dry total nitrogen (Kjeldahl) determinations. A composite sample of all quadrats of a treatment plots were then mowed and the residues were placed on the surface throughout the winter to protect the soil from blowing. Second growth of Sudan grass occurred before frost. Little decomposition of the tops.

The yields and nitrogen analyses are shown in Table 1. Nitrogen fertilization significantly increased the plant height, yield of dry matter, and nitrogen content of the tops. The nitrogen recovered in the tops was about 40% of that applied. Nitrates were not apparent in the tops.

Common Sudan grass was seeded June 27. The seedlings were 3 inches high, nitrogen deficiency symptoms were clearly visible on plants in the check plots. All treatments were clearly apparent on differences in plant height or color. Plant heights and oven-dry weights on two quadrats from each treatment were obtained on August 29, when plants were in bloom. Samples were taken for oven-dry total nitrogen (Kjeldahl) determinations. A composite sample of all quadrats of a treatment plots were then mowed and the residues were placed on the surface throughout the winter to protect the soil from blowing. Second growth of Sudan grass occurred before frost. Little decomposition of the tops.

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