chemically treated by the cut-surface method. During the spring, the trees started to show effects of the treatment and by fall a greater portion were dead or dying; however, no noticeable influence on herbaceous vegetation was noted during this growing year. Starting in 1961, responses were observed, with increased forage production resulting from the removal of tree competition with herbaceous vegetation. The five years, 1961 through 1965, represented the treatment period during which trees were killed. The area was later cleared with fire and seeded. During the treatment period, the increase over pretreatment values on a yearly per acre basis was 77.4 sheep days, 10.1 lbs of lamb, and 1.5 lbs of wool. Assigning these sheep product values per acre, per year, to this period the total was $12.76 or an increase of $7.57. Treatment of the trees involved cost of labor and chemicals, and averaged $19.49 per acre. Tree density varied from about 150 stems per acre to over 700. Cost to treat trees varied depending on species, trunk diameter, density per acre, and slope of ground.

Burning

The second part of the treatment involved removing the dead tree debris by fire, and seeding with grasses and legumes. By the summer of 1965, five years after the trees were treated, they were sufficiently dry for burning to be an efficient cleanup method. Grazing in the spring of 1965 was reduced to allow a residue of grass to accumulate to help spread the fire. In July a controlled burn was initiated resulting in a clean burn with considerable ash deposited on the ground for a good seedbed. Later (in September) a mixture of adaptable grasses and legumes was seeded; these burning and seeding costs were $15.38 per acre. Grazing was also reduced in the growing season of 1965–66 to allow the seeded species to become established.

The third period (post-treatment) started in 1966 where the increased income due to improvement would be measured by sheep production. During this six-year period, ending in 1971, sheep days per acre per year increased over the pre-treatment period by 177.8, lamb production by 40.9 lbs, and wool by 4.87 lbs.

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Effects of nitrogen on yields

J. ST. ANDRE

The economically optimum yield for INIA 66 wheat was obtained by using 150 lbs of nitrogen and 30 lbs of phosphorus per acre in these tests. Nitrogen had greater effect on yields than phosphorus, however, maximum yields were realized by using a combination of nitrogen and phosphorus as a fertilizer. Darker green color intensity was obtained with higher rates of fertilizer. Higher rates of phosphorus have a tendency to suppress the bushel weight. The highest net dollar return was obtained by using 150 lbs of nitrogen and 30 lbs of phosphorus per acre.

TESTS IN 1971 showed yield responses to phosphorus in late planted INIA 66 wheat. A 1972 experiment (reported here), conducted at the West Side Field Station on a panoche clay loam soil, was designed to determine specifically the combined effects of phosphorus and nitrogen on INIA 66 wheat yields planted in early November 1971.

The test area was pre-irrigated with 15 inches of water in October 1971 with soil samples indicating a full profile to a depth of 6 feet. The following factorial design was chosen with four replications and 12 treatments: the amount of N and P applied are given in lbs per acre, and the source of nitrogen and phosphorus was from ammonium sulfate and treble super phosphate respectively T_1 ON-OP, T_2 ON-30P, T_3 ON-60P, T_4 ON-120P, T_5 75N-OP, T_6 75N-30P, T_7 75N-60P, T_8 75N-120P, T_9 150N-OP, T_{10} 150N-30P, T_{11} 150N-60P, T_{12} 150N-120P. All fertilizer treatments were drilled-in a few days prior to planting. INIA 66 was planted on November 10, 1971 at a seed rate of 125 lbs per acre.

Early in the season, foliar color differences were noted between the various fertilizer treatments. On February 8, 1972, a visual evaluation of color intensity was made for all treatments. A color rating scheme of 1 to 4 (light to dark green) was used; at the time of evaluation, plants were 4 to 8 inches in height.

A difference in value between nitrogen and phosphorus rates was observed. A comparison of color ratings indicated that a definite color change appears early in the season at low rates of nitrogen and phosphorus (table 1). The color variable may be difficult to differentiate without comparative treatment levels side by side, however.

Since color difference appears early it may be possible to apply the nitrogen in the irrigation water at the time of the first irrigation. Phosphorus probably should not be applied as a topical application due to possible foliar phytotoxicity.

Three irrigations

Three irrigations were applied during the season in all treatments. In the first irrigation, applied on February 28th at the jointing stage, all treatments were given 8.5 inches of water. The second and third irrigations were applied to all treatments at the flowering and milk stages, and received 7.6 inches and 7.3 inches of water respectively—for a combined season total of 23.4 inches of applied water. An additional 5.6 inches of water was depleted from the soil during the growing season which represented 29 inches of evapotranspiration for INIA 66 for the entire season.

Soil samples taken during the growing season and after harvest indicated that very little moisture was removed below the 4 ft depth. In previous barley irrigation experiments, barley extracted more moisture from the 4 to the 6 ft depth

and phosphorus rates of INIA 66 WHEAT

H. YAMADA   R. M. HOOVER

than INIA 66 wheat. Further experiments will be conducted to determine whether or not wheat is as deep rooted as barley.

Individual plots were harvested on June 15, 1972. After averaging the yields obtained at all phosphorus rates for respective nitrogen levels, a difference greater than 2,500 lbs of grain per acre was found between no nitrogen and 150 lbs of nitrogen per acre. By comparison, after averaging all nitrogen yields at each phosphorus level, an increase of 840 lbs was obtained from applications of 0 to 120 lbs of phosphorus per acre. (See graph.)

Significant difference

A significant difference in yields (at the 1% level) was observed among nitrogen and phosphorus treatments. No significant interaction was noted between nitrogen and phosphorus treatments. With the exception of the no-nitrogen treatment, additional yields were noted as a result of adding phosphorus in increments of 30, 60, and 120 lbs per acre at the 75- and 150-lb nitrogen level. Similar fertility trials conducted with barley did not result in a phosphorus response. The bushel weight was reduced significantly (at the 1% level) at the no-nitrogen level. Higher rates of phosphorus have a tendency to suppress the bushel weights of wheat; however, this was not significant in this test. Phosphorus had a similar effect the previous year, when the bushel weight was significantly reduced by application of 160 lbs of P per acre.

An economic analysis was made of the experiment and the results are shown in table 2. The cost of fertilizer was based on $.10 per pound for nitrogen and $.253 per pound for phosphorus. The return for wheat grain was based on roadside price of $2.80 per cwt. The net return over the unfertilized treatments ranged from a loss of $17.20 per acre to a gain of $55.53 per acre. The cost of fertilizer to obtain these yield increases varied from $7.50 to $45.36 per acre. The highest net return was obtained by applying 150 lbs of N and 30 lbs of P per acre. Subsequent increases in fertilizer rates increased yields, but reduced the net return. The figures in the net return column do not reflect the additional costs which are incurred as a result of added yields. Such additional costs as fertilizer application, harvesting, marketing, and others are relatively minor but should be considered when arriving at a true net return.

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EFFECTS OF FERTILIZER RATES ON INIA 66 WHEAT YIELDS

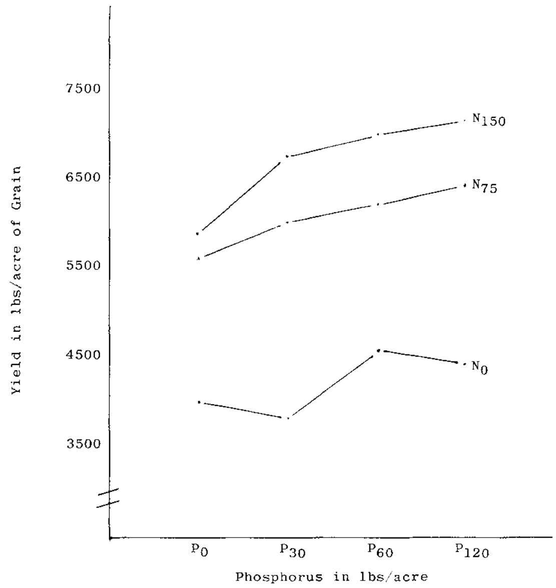

TABLE 1. EVALUATION OF WHEAT COLOR ON FEBRUARY 8, 1972

Nitrogen rates	Phosphorus rates in lbs per acre P_0	P_{30}	P_{60}	P_{120}	Mean
lbs./acre	Color rating*				
N_0	1.5	2.0	1.8	2.0	1.8
N_{75}	1.8	3.0	3.3	3.8	2.9
N_{150}	2.0	2.8	3.8	3.8	3.1
Mean	1.8	2.6	2.9	3.2	

* Color ratings from 1 to 4 representing minimum (1) maximum (4) green color of plants.

TABLE 2. INIA 66 WHEAT YIELD, AND FERTILIZER COSTS AND RETURNS PER ACRE

Materials applied N	P	Crop yields	Yield increase	Fertilier costs*	Net return over unfertilized treatment @ $2.80/cwt
lbs/acre		lbs/acre	lbs/acre	$	$
0	0	4020	....	....	....
0	30	3860	−160	7.59	−12.07
0	60	4610	590	15.18	1.34
0	120	4490	470	30.36	−17.20
75	0	5690	1670	7.50	39.26
75	30	6080	2060	15.09	42.59
75	60	6290	2270	22.68	40.88
75	120	6500	2480	37.86	31.58
150	0	5960	1940	15.00	39.32
150	30	6810	2790	22.59	55.53
150	60	7060	3040	30.18	54.94
150	120	7210	3190	45.36	43.96

* Fertilizer costs based on $.10 per lb for nitrogen; $.253 per lb for phosphorus.