

INFLUENCE OF NITROGEN FERTILIZATION ON GRAIN PROTEIN CONTENT AND NPK CONTENT OF STRAW IN LATE SOWN WHEAT (*Triticum aestivum* L.)

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A field experiment was conducted to investigate the effect of nitrogen fertilization on grain protein and content of straw of NPK by late sown wheat cultivar. From the observations it was noticed that increase in level of nitrogen, increased the grain protein content. Grain protein content was significantly correlated with amount of nitrogen applied. From the NPK content of straw it was observed that nitrogen fertilization caused increase in nitrogen decrease in content of phosphorus and again increase in content potassium in late sown wheat.

Key words: Nitrogen fertilization, Grain protein, Uptake.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is a preferred food of our people amongst all cereals grown in Pakistan. The great economic importance of wheat lies in its valuable content of high quality protein content is most important criteria for quality of wheat. Higher the percentage of protein, better is the quality of grain. The figures of protein content change from variety to variety and under different set of conditions. (Kent Jones and Amos [3]). Further protein of wheat plays a vital role in compounding balanced ration of animals as well as poultry. Thus it has great industrial value also.

The performance of normal wheat varieties is affected if they are sown late. To overcome the problem late varieties have been evolved which complete their cycle within a short time. These varieties are heavy feeders and require balanced amount of nutrients such as NPK for their proper growth in general and nitrogen in particular. The nitrogen which is the major constituent of all proteins, is deficient in our soils. Further the information regarding influence of nitrogen fertilization on grain protein content and uptake of NPK by wheat plant is not proper. Although some research workers have observed increase in protein content with increase in level of applied nitrogen (Spratt [5] and Penk [4]). Still research under local conditions is necessary. Therefore this project was planned to know the influence of nitrogen fertilization on grain protein content and NPK content of straw in late sown wheat.

MATERIALS AND METHOD

A field experiment was conducted at Latif Farm, Sind Agriculture University, Tandojam, during the year 1983-84. Sonalika wheat cultivar was sown in the 2nd week of December. The fertilizer nitrogen in form of urea at the rate of 0, 40, 80, 120, 160, 200 and 240 kg N per hectare was applied to the crop in two splits, half at

the time of sowing and half at first irrigation. A uniform doze of 75 kg P_2O_5 per hectare was applied to the crop, at the time of sowing in the form of single super-phosphate. The experiment was laidout in randomized complete block design. In all there were twenty one plots accomodating seven fertilizer treatments and their three replications. After harvest 10 plants were taken from each plot. The straw and grains were separated, dried at 68° , ground and each analysed for total nitrogen, phosphorus and potassium content. The grain protein content was calculated by multiplying nitrogen per cent of grain by factor 5.7 [3].

Prior to sowing of the crop, composite samples of soils were taken at the depth of 0-30 cms from experimental plot to determine the physico-chemical characteristics of experimental site.

Nitrogen in soil and plant was determined by following Kent Jones and Amos [3], whereas phosphorus and potassium as described by Jackson [2] and the recorded data was subjected to statistical analysis to test the difference between treatment means. Correlation between level of fertilizer nitrogen and grain protein content was calculated.

RESULTS AND DISCUSSION

The physico-chemical characteristics of soil (Table 1) indicated that the soil under the experiment was clay-loam in texture, alkaline in reaction, non-saline, deficient in organic matter and nitrogen.

According to Table 2 the grain protein level significantly increased with increase in level of applied nitrogen. The increase in protein was almost 1 per cent with addition of each 40 kg nitrogen per hectare. Grain protein content was significantly correlated with the amount of nitrogen applied which proved that nitrogen, the main constituent of protein, is the main agent in increasing the grain protein content in late sown wheat. Many other research workers (Spratt, [5]; Vanchev, [7]; Turuleva *et al.* [6], also reached at the above conclusion.

Table 1. Physico-chemical characteristics of experimental site.

Texture class	Clay loam
	(Sand 22%, Silt 43%, Clay 35%)
pH	8.0
ECX 10 ³	0.27
Ca CO ₃ %	8.0
Organic matter %	0.88
Total Nitrogen %	0.04
Available P-ppm	10.00
Available K-ppm	290.00
(Amm. Acetate)	
Extractable	

All figures are average of 3 replicates.

Table 2. Effect of different nitrogen levels on grain protein percentage (N x 5.7) in wheat.

Treatment	Protein in %	% Increase over control
0	8.7 a	
40	9.9 b	13.19
80	10.7 c	22.07
120	11.5 d	31.74
160	12.3 e	40.38
200	13.4 f	53.24
240	14.5 g	65.52
L.S.D. (0.05)	0.613	
Correlation Co-efficient	0.9978**	

(i) Figures followed by same letter are statistically alike.

(ii) All the figures are average of three replicates.

According to Table 3 indicating NPK content of straw, it can be seen that nitrogen content of straw increased with each increase in the nitrogen level; which indicated better uptake of nitrogen by plants on the whole with increase in level of applied nitrogen. In case of phosphorus, it decreased with increase in nitrogen level. This was probably due to fixation of applied phosphorus. Further because application of nitrogen increased growth, and amount of phosphorus was the same, which probably got diluted in various plant parts. This is also an indication that if phosphorus more than 75 kg per hectare were applied, there were possible chances to have better results. Due

Table 3. Effect of different levels of nitrogen on NPK content of wheat straw.

Treatment	N%	P%	K%
0	0.32 f	0.09 a	2.1 c
40	0.35 ef	0.09 a	2.2 dc
80	0.37 e	0.08 b	2.4 d
120	0.47 d	0.08 b	2.6 cd
160	0.52 c	0.07 c	2.8 c
200	0.61 b	0.06 d	3.1 b
240	0.76 a	0.06 d	3.6 a
L.S.D (0.05)	0.04	0.008	0.20

(i) All figures are average of 3 replicates.

(ii) Figures followed by same letter are statistically alike.

to high calcium content of soil (8 per cent) the applied phosphorus almost gets fixed and limited amount is available for plant growth. The potassium, which play important role in making the plant more hardy and disease resistant, it's content in straw gradually increased with nitrogen level. This was due to availability of potassium in soil in sufficient amount. Eweida *et al.* [1] also found increase in potassium content of wheat plant with increased nitrogen and phosphorus application.

From the experiment it is therefore concluded that nitrogen application plays a vital role in increasing the protein content of grain and thus its quality. It also increased potassium uptake by plants and caused dilution and consequent decrease in phosphorus content of plants.

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