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BREADWHEAT RESPONSE TO NITROGEN AND PHOSPHATE FERTILIZER AT DAYCHOUNIEH (LEBANESE COAST)

M. ABI-ANTOUN
C. MHANNA

ABSTRACT

Four Varielies (V) of aestivum wheat Seri 82 (V_1), Haramoun (old)(V_3), A0 41 Emu «S» (V_2) and Dove/Ald (new) (V_4) were subjected to three levels (N_1, N_2, N_3) of N fertilizer, 0, 100 and 200 kg/ha respectively, and two levels (P_1, P_2) of Phosphate, 0 and 100 kg/ha. 411 combinations of V, N and P were utilized in a Split Plot Design with varieties as main plots and NP combinations as sub-plots. Grain Yield, Straw Yield, Agronomic Characters and Grain Quality were used as indicators of performance. Correlation and analyses of variance indicated significant relations between grain yield and quality characters and significant differences between varieties in response to N and P fertilizers. The best practical result was observed with fertilizer rate of 100 kg/ha for each of N and P giving highest yield in grain (over 7 Tons/ha) having a high content of protein (13%) in the coastal sub-humid lebanese environment located at 300 m elevation. The new variety Dove/Ald (V_4) proved to be better than the best commercial variety V_1 (serie 82) indicating continuity of progress in finding new varieties with high yield potentiel. Under fully rainfed coastal conditions, grain yields as high as 7.0 Tons/ha could be obtained, and straw yields are at least 2.5 times that of the grain. These results encourage cereals to revisit large neglected land along coastal and mountainous areas of Lebanon.

Keywords: Nitrogen, Phosphate nutrition, sub-humid bread wheat.

INTRODUCTION

Lebanon, like many countries of the Middle East, is a net importer of grain. The shortage in staple food production is over 80 percent for most agricultural

commodities. Four hundred thousand tons of breadwheat are annually imported to Lebanon and the local production of durum and aestivum wheat is around 35.000 Tons (ICARDA, 1993). This situation is inducive to production intensification with all possible means and available technologies. The coastal areas have a high proportion of neglected land with a sizable potential of production. Breadwheat is a high yielder and more adapted to coastal conditions. Need and increased yields are valuable incentives to use every inch of cultivable land for producing efficiently, staple food and economic crops.

The coastal areas of Lebanon receive high winter rainfall (over 700 mm, MOA, UNEP, 1996) and have mild climatic conditions. This provides for an excellent environment of high yield potential. The use of new high yielding varieties and their technological needs of cultural practices as: Nutrition (N, P, K), weed control etc..., could give yields compatible with other agricultural crops. The present study is aimed at reexploring the potential of new breadwheat varieties when given the chance to perform under variable levels of N and P fertilizers. Improvements in Yield of grain and grain quality are expected.

MATERIALS AND METHODS

The experiment station of the Faculty of Agriculture, Holy Spirit Unrversity, Kaslik, at Daychounieh, was used to study response of four varieties of breadwheat namely: V_1: Seri 82, V_2: A0 41 Emu «S», V_3: Haramoun and V_4: DovelAld, to three levels of N fertilizer, 0, 100 and 200 kg N/ha (N_1-N_3), respectively. Two levels of Phosphate $P_1 = 0$ and $P_2 = 100$ kg P205/ha. Four varieties, 3 levels of N and two levels of P resulted in 24 combinations arranged in a Split Plot design with varieties, as main plots and NP treatments as sub-plots. Plots consisted of two meter rows at 30 cms spacing with four replications. Sowing density was 125 kg seed/ha. Weed control was done by hand and by 2.4-D sprays. Mice control was made by applying Rato, Coumarol Rodenticide and bird control by using Nuvacron. Classical methods were used in harvesting and threshing the grain. Straw yield, grain yield and quality characters were determined using weight, NIR (GQA-31EL) for protein analyses. Sedimentation and Farinograph (Brabender) readings were made according to methods used by ICARDA (International Center for Agricultural Research in Dry Areas) Laboratories in Aleppo. Data analyses were made on computer VAX 11/VMS and PS/2 Model 502 using CR1SP program, used at ICARDA to give output on, correlation, regression and analyses of Variance (ANOVA).

RESULTS AND DISCUSSION

The varieties used in this experiment were supposed to differ in their response to the natural and artificial conditions o the new environment along the lebanese coast with high precipitation and mild temperature regimes. The variety Seri 82 (V_1) is one of the highest yielders among aestivums in Lebanon and the Region white Haramoun (V_3) was the best yielder from 1975 until 1986.

The two new varieties V_2: A0 41 Emu «S» and V4: DovelAld had promising yield potential in semi-arid conditions of the Bekaa Valley.

The results for various agronomic characters as regards the parameters (Variety, Nitrogen and Phosphorus) are shown in Table 1 for mean square significance. Grain yield is illustrated in Figure 1, Protein content in Figure 2, Sedimentation in Figure 3, and Correlation among various agronomic and quality characters for the new variety V_4: DovelAld is shown in Table 2.

These results support many of the former ideas and generalizations on differences between varieties in the same environment and their different responses in dissimilar environments. There were significant differences among varieties for all agronomic characters studied implying the specificity of the coastal environment and the adaptability that each variety possesses in terms of its response to the prevailing conditions (SAYAR *et al.*, 1992, TAHER and NAZIR, 1984). The marketable yield of wheat (grain and straw) was highly influenced by phosphate nutrition while nitrogen nutrition has influenced not only grain yield but all other agronomic and quality characters. One and two way interactions were observed for N, P, and varieties especially in the expression of grain yield, the trait of utmost interest in most situations (ZAHOOR *et al.* 1989 obtained similar results). These interactions imply that in any environment, when a new variety of a crop (or a crop) is introduced, the fertilizer practices must be re-evaluated accordingly.

There is a general notion that lebanese soils are low in P, and N as a result of their limestone mother rock and dry summer conditions. Fertilizer N and P are almost always recommended as an agricultural practice.

Yield (Figure 1) and quality characters (Figure 2) respond positively, noticeably and significantly to fertilizer N and to combinations of N and P. The new variety V_4 (DovelAld) has continuously responded to nutrition treatments better than others. The highest N rate was 150 Kg/ha and for P was 100 kg/ha.

Fuehring and Chaudhry, 1969, tended to recommend N rates higher than 300 g/ha for new wheat varieties planted in the Beqaa valley.

The recommended rate supported by the above results is 100 Kg N/ha and 100 Kg $P_2 0_5$ lha. This conforms to formerly recommended practices for cereals in many lebanese provinces with extra rain or supplemental irrigation facilities. It also conforms to practices in other countries in the near region. (ZAHOOR *et al.*, 1989, RAYAN *et al.*, 1989, PRAKASH *et al.*, 1990, and SAHA *et al.*, 1991). Grain yields around 7.0 Tons/ha and over 150 Tons/ha of straw are inducive, not only to use available land for winter cereals but also to consider an active enhancement of the animal production for ruminants. The lebanese agriculture is very poor in roughage production and straw has been a valued product, sometimes almost as important as grain. Some scattered areas to the Westside of mount Lebanon in the South, North, Batroun and Jbeil plant wheat mainly as a straw «Tibn» source and the grain is consumed locally. Farmers in those areas plant traditional varieties, land races or whatever they get easily. The use of new improved varieties could make their crops more economical and their animals more productive.

Table 1. Mean square significance for various agronomic characters

	D.F.	Grain / Spike	Straw Yield T/ha	Grain Yield T/ha	Plant Height cms	1000 Kernel weight grs	Spikes / m²
Replication	3	58.931	21.682*	3.258*	650.344**	46.177*	8313.122
Variety (V)	3	893.514**	167.796**	14.39**	1277.205**	742.733**	11524.233
Residual	9	97.329	3.281	0.513	27.603	11.27	3055.853
Phosphorus (P)	1	294	20.935**	2.905**	71.760	0.094	243.844
V×P	3	6.361	5.075*	0.649*	1.038	1.038	562.149
Nitrogen (N)	2	878.573**	239.936**	33.495**	809.260**	221.698**	11408.885*
V×N	6	55.837	13.572**	1.85**	25.163	32.212**	4181.191
N×P	2	492.969*	5.757*	0.728*	42.948	0.094	4461.781
V×N×P	6	14.455	9.692**	1.392**	7.184	1.997	3234.253
Residual	60	10.012	1.678	0.23	19.28	3.298	2294.837
Total	95						

* Significant at 5%
** Significant at 1%.

Table 2. Correlation Coefficient for Various Agronomic and Quality Characters for the new Variety V_4: Dove/Ald

	RP Straw Yield T/ha	RG Grain Yield T/ha	PHL plant Height cms	SDS Sedimen-tation	KW Kernel weight grs	ND Spikes/m²	PRO Protein	NFST Farinograph Starting Time	NFMT Mixing Tolerance Brabender Units (BU)
GSP	0.779	0.779	0.947**	0.343	-0.665	0.323	0.431	0.394	-0.389
RP		0.94**	0.88**	0.7488	-0.932**	0.817*	0.81	0.643	-0.491
RG			0.88*	0.748	-0.931**	0.818*	0.83	0.644	-0.491
PHL				0.564	-0.832*	0.495	0.631	0.491	-0.348
SDS					-0.86*	0.741	0.993**	0.634	-0.245
KW						-0.725	-0.888*	-0.477	0.19
ND							0.776	0.783	-0.629
PRO								0.682	-0.324
NFST									-0.876

* Significant at 5%

** Significant at 1%.

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Fig. 1. Grain Yield (T/ha) of four bread wheat varieties

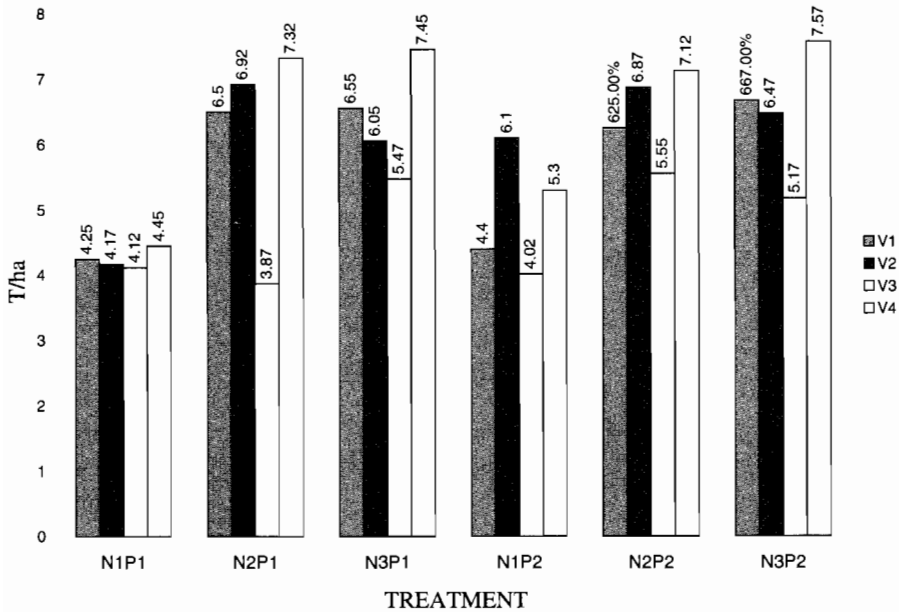

Fig. 2. Protein content (%) of four varieties of bread wheat at various levels of N and P fertlilizers