COMPARATIVE YIELD STUDIES ON VARIETY BLENDS IN WHEAT

RIAZ A. KHAN, M. NAWAZ AND M. ARSHAD*

Mexi-Pak-65, A.U. 44, A.U. 49 (exotic selections) and C. 273, a local cultivar, were grown in pure as well as in composite stands of two each, using a seed rate of 40 seers to an acre. In the composite stands, the seed of the two components was blended in the ratios of 1: 1, 1: 3 or 3: 1 before sowing. Blending the seed in different proportions or the heterogeneity of the growing conditions failed to confer any measurable advantage to the composite stand over the component elite variety in its pure stand.

INTRODUCTION

It has been reported that blending two or more genotypes of a crop species results in stabilization of yield (Klags, 1936; Mumaw and Weber, 1957; Heyne and Sidding, 1965; Clay and Allard, 1969; Rasmusson and Cannel, 1970). In many cases, these workers also obtained increased yield of a blend as compared to the components in pure stands. This stability of production and increase in the yield of a blend was attributed to its greater environmental adaptation and protection against diseases (Heyne and Sidding, 1965). Similarly, Frankel (1939) had suggested earlier that the difference in the requirements may create better conditions for the individual plant in a blend than in pure stand and consequently the efficiency of nutrient uptake may be higher in the mixed population. Frey and Uriel (1967) stated that such advantages of mixed sowing may multiply in case of increase in environmental heterogeneity. Hence, the complementary effect, if any, on the yield by growing different wheat genotypes in mixtures of two in each blend, and their components in pure stands was investigated under the conditions obtaining at Lyallpur, Pakistan.

MATERIALS AND METHODS

A series of experiments were laid out on a sandy clay loam soil at the West Pakistan Agricultural University, Lyallpur during the crop seasons of 1968-69 and 1969-70. The pH of the soil was 7.8 and it was fairly low in organic matter and available N and P_2O_5. The varieties selected for these studies were Mexi-Pak-65, A.U. 44 and A.U. 49, exotic selections, and C.273, a local cultivar. They were planted in pure as well as in composite stands of

*Department of Agronomy, Faculty of Agriculture, West Pakistan Agricultural University, Lyallpur.

two each, using a seed rate of 40 seers to an acre. In the composite stands, the seed of the two components was blended in the ratios of 1 : 1, 1 : 3 or 3 : 1 before seeding. Appropriate experimental design with 3 or 4 replications and a net plot size varying from 1/48 to 1/80 acre was used in different experiments. Sowing time was varied from normal (Mid-Nov.) to very late (Mid-Jan.) in order to effect environmental heterogeneity, especially in temperature, humidity and day length during the growing period. The crop was fertilized at the rate of 40 lb. of P_2O_5 at sowing and 80 lb. N with first irrigation. Three irrigations after planting were given to mature the crop which was harvested by the end of April each year. Duncan's Multiple Range Test was employed to establish statistical significance among the treatment means.

RESULTS AND DISCUSSION

The results in Table 1 show that the yield, in general, was measurably depressed with each planting date. This depression in yield was more steep during the first year, which was characterised by abnormal variations in temperature and humidity at the critical stages of the crop development.

Within the planting dates, although blending the seed of Mexi-Pak and A.U. 44 in equal proportion increased, in some cases, the yield of a blend over its components in pure stands under Nov.-Dec. planting, but this increase in yield was not statistically significant. These observations were further supported by the data in Table 2, which reveal that similar blending of Mexi-Pak, A.U.44, A.U. 49 and C.273 in all possible combinations of two each, failed to confer any measurable advantage over the respective elite components in pure stand. This was due to the reason that the yield components like plant stand, spike bearing tillers per unit area, number of grains per spike, 1000-grain weight in composite stands were not favourably effected as compared to those of the elite componeat in its pure stand. However, in some instances, the yield of a composite stand was higher than that of its non-elite component in pure stand, which was attributable to the contribution of the elite component comprising 50 per cent of the blend.

The results discussed so far, suggest that neither the mixing of seed in different proportions nor the heterogeneity of the growing conditions could cause any significant difference in the yield of the composite stand over that of the elite component in pure stand. These observations differ from those of Khan and Bradshaw (1966), Clay and Allard (1969). The former workers reported that mixing seeds of *Linum usitatissimum* in 1 :3 ratio is superior to that of 1 : 1 ratio, while the latter were of the view that the advantage of blending is intensified with the increase in heterogeneity of the environments. These differences in results could be due to the difference in the species and the environment under

TABLE 1.—*Average grain yield in maunds per acre of the pure/composite stands of wheat planted from the middle of November to the middle of January.*

Pure/composite stand	1968			1969		
	Planting Dates			Planting Dates		
	Nov. 15	Dec. 15	Jan. 15	Nov. 15	Dec. 15	Jan. 15
A.U. 44	35.21	27.71	10.58	36.50	29.02	20.79
Mexi-Pak-65	37.75	27.25	10.33	35.50	34.83	18.34
A.U. 44 + Mexi-Pak-65(3:1)	34.58	28.62	10.21	36.80	34.96	18.00
A.U.44 + Mexi-Pak-65(1 : 1)	43.13	23.08	9.46	41.30	37.96	18.60
A.U.44 + Mexi-Pak-65(1 : 3)	33.08	23.58	9.87	36.80	35.66	14.34
	NS	NS	NS	NS	NS	NS

NS—Treatment means within each column were non-significant at 5 per cent level.

TABLE 2.—*Average grain yield in maunds per acre of the pure and the composite stands in* 1 : 1 *blend*

Pure/composite stand	1968-69	1969-70	Average
Mexi-Pak-65	44.47 a	41.53 a	43.00 a
C.273	28.32 e	24.80 d	26.56 d
A.U. 49	37.86 abc	31.15 c	34.50 bc
A.U. 44	41.84 ab	36.62 ab	40.23 a
Mexi-Pak-65 + C. 273	35.48 bcd	34.72 bc	35.10 b
Mexi-Pak-65 + A.U. 49	40.02 ab	35.09 bc	37.55 b
Mex -Pak-65 + A.U. 44	43.35 a	34.27 bc	38.81 a
C.273 + A.U. 49	30.55 de	30.15 c	30.35 cd
C.273 + A.U. 44	32.04 cde	30.95 c	31.49 bcd
A.U. 49 + A.U. 44	38.41 abc	38.28 bc	36.84 bc

Duncan's Multiple Range Test at 5 per cent probability. Any two means within each column not sharing a letter in common, differ significantly.

which the investigations of the other workers and those reported in this study were carried out. Failure of blending to increase the yield in different crop species was also reported by Hinson and Hanson (1962), Funk and Anderson (1964) and Shaalan *et al.* (1966).

LITERATURE CITED

Clay, R. E., and R. W. Allard. 1969. A comparison of the performance of Homogeneous and Heterogeneous barley population. *Crop Sci.* **9** : 405-407.

Frankel, O. H. 1939. Analytical yield investigation on New Zealand Wheat. IV. Blending varieties of wheat. *Jour. Agr. Sci.* **29** : 249-261.

Frey, K. J., and M. Uriel. 1967. Relative productivity of Homogeneous and Heterogeneous oat cultivars in optimum and sub-optimum environments. *Crop Sci.* **7** : 532-536.

Funk, C. R., and J. C. Anderson. 1964. Performance of mixtures of field corn (*Zea mays* L.) hybirds. *Crop Sci.* **4** : 353-356.

Heyne, E. G., and M. A. Sidding. 1965. Intra-cultivaral variation in hard red winter wheat. *Agron. Jour.* **57** : 621-624.

Hinson, K., and W. D. Hanson. 1962. Competition studies in soybeans. *Crop Sci.* **2** : 117-123.

Khan, M. A., and A. D. Bradshaw. 1966. Competition studies in Linum. *Pak. Jour. Agr. Sci.* **3** : 91-112.

Klages, K. H. W. 1936. Changes in the proportion of components of seeded and harvested cereals in abnormal seasons. *Jour Amer. Soc. Agron.* **28** : 935-940.

Mumaw, C. R., and C. R. Weber. 1957. Competition and natural selection in soybean varietal composites. *Agron. Jour.* **49** : 154-160.

Rasmusson, D. C., and R. Q. Cannel. 1970. Selection for grain yield and components in barley. *Crop Sci.* **10** : 51-54.

Shaalan, M. I., E. G. Heyne, and J. R. Lofgren. 1966. Mixture of hard red winter wheat cultivar. *Agron. Jour.* **58** : 89-91.