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# An assessment on Yield, Quality, Marketing Price and Profitability of Some Bread Wheat (*T. aestivum* l.) Field Mixtures vs. Lean Cultivars

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## Abstract

The study aimed to investigate the stability of grain yield, milling characteristics, dough quality, marketing price and profitability of some bread wheat field mixtures vs. cultivars. Mixtures were built up referring preferences of regional milling industry. Field trial was carried out in the experimental field of GAP TEAM Talat Demirören experimental station in Şanlıurfa in 2016-17, 2017-2018 and 2018-19 growing seasons. Varying number of mixtures and lean varieties (total 15 - 20 entries x 3 years) employed in building up these mixtures was tested employing randomized complete block design with 4 replications. Some of traits were tested through analysis of variance, correlation and regression.

The results revealed that mixture can compete with the lean varieties perfectly for grain yield, stability in grain quality, milling characteristics, dough properties, and suitability for palatable end products, marketing price and profitability.

2:2:1 sowing ratio of Dariel: Ceyhan-99: Sagittario (or any high quality spring type or alternative variety) seems to be promising. Mixtures rise to be insurance for farmers against unstable and adverse weather conditions exposed often recently in the region.

***Keywords:*** *Bread Wheat; Field Mixtures; Agronomical and Quality Characteristics; Profitability*

## Introduction

Wheat acreage of South-East of Anatolia was 792.502 ha and the production was 2.640.674 tons with average grain yield of 312 kg $da^{-1}$ (TUIK, 2017). The acreage of Sanliurfa province was 186,779 ha and the production was 632,257 tons with an average yield of 338 kg $da^{-1}$ (TUIK, 2017). Field mixtures of some crops have some benefits for farmers, industry and end product users [1-3]. Mix planting of some wheat cultivars can make a cease fire with surrounding environment. Mixing cultivars can compensate for the missing points of each other such as lodging, pest and disease tolerance [4]. Canadian and US farmers practiced field mixtures in wheat and achieved yield stability and decrease the pest severity [4-8].

This study aimed to assess some of yield, quality, marketing price and profitability of some of bread wheat field mixtures. Therefore a new approach was intended to adopt in the region and neighboring countries.

## Material and Methods

Field trials were carried out at the Koruklu experimental stations of the GAP Agricultural Research and Training Center in 2016-17, 2017-18 and 2018-19 growing seasons. Randomized complete block design with 4 replications was employed. 8 mixtures and 7 lean

varieties were tested in 2016-17. 10 Mixtures and 9 lean varieties were tested in 2017-18 and 9 mixtures and 6 lean varieties were tested in 2018-19. Some of yield components, some of grain quality traits, some of milling characteristics, some of dough rheological properties were scored by relevant internationally recognized methods. Data were analyzed through variance, correlation and regression. Profitability was calculated by multiplying grain yield by marketing prices.

## Results and Discussion

Entries were found statistically significant for all characteristics under study (ANOVA's were not given here).

### Grain yield (kg da$^{-1}$)

The result revealed that pure varieties gave higher average grain yield (684 kg da$^{-1}$) than mixtures (674 kg da$^{-1}$). Mixture number 1 and 4 gave higher grain yields than the average of pure lines with 706 and 710 kg da$^{-1}$ respectively in 2016-17. In 2017-18, mixtures gave higher grand mean for grain yield (541.50 kg da$^{-1}$) than that of pure varieties (494.16 kg da$^{-1}$). But the lean variety of Dariel placed in the first rank with a 668, 75 kg da$^{-1}$ and the mixture 6 were in second rank with 622, 75 kg da$^{-1}$. Mixtures in 2018-19 gave higher average grain yield (541.50 kg da$^{-1}$) than that of pure varieties (494.16 kg da$^{-1}$). Lean varieties giving highest and lowest ranks varied greatly for both yield traits under study. Mixtures generally gave higher average ranks and were found relatively stable in three growing seasons.

### Quality traits

In 2016-17, some milling and dough rheological properties of mixtures such as ash content (%), gluten (%), sedimentation (ml) were lower than those of pure varieties. Flour ratio (%) of mixtures was only trait giving higher value than that of pure varieties. $K_6$ (61.8 cm$^2$) and $K_7$ (61.2 cm$^2$) mixtures gave the highest energy scores 90 minutes after dough production.

In 2017-18, some quality properties of mixtures such as 1000 kernel weight (g), protein (%) sedimentation (ml), gluten index (%) were lower than those of pure varieties. Hectoliter weight (kg) and wet gluten (%) of mixtures gave higher value than that of pure varieties.

In 2018-19, some quality properties of mixtures such as hectoliter weight, mixtures (74,97 kg) were found lower than pure varieties (75,07 kg). 1000 kernel weights of mixtures (36,21g) were higher than that of lean varieties (34,82g). Flour yield (60,83%) was lower than that of lean varieties (65,67%). Bran ratio was higher in mixtures (39,35) than that of lean varieties (34,31%). Ash content (0,702%) of mixtures was lower that of pure varieties (0,713). Protein content (13,93%) was slightly lower than that of pure varieties (13,94%). Gluten index (37,15%) of mixtures was slightly lower than that of lean varieties (37,23).

### Marketing price (TL kg$^{-1}$)

Mixtures gave higher grand mean for marketing price (0,919 TL/kg) than that of lean varieties (0,900 TL) (kg) in 2016-17. In 2017-18, mixtures gave higher grand mean for marketing price (1.218 TL) than that of lean varieties (1.162 TL). Lean variety of Dariel placed in the first rank with 1,288 TL/kg in 2017-18. Mixtures also gave higher marketing price (1.218 TL/kg) than pure varieties (1.162 TL/kg) in 2018-19.

### The coefficients of correlation and regression

In 2016-17, the coefficients of correlation grain yield vs. number of spike per unit area (r = -0.486**), number of spikelet spike$^{-1}$ (r = -0.333**), number of days to maturity (r = -0.351**), number of days to emergence (r = --0.334**), grain weight spike$^{-1}$ (r = -0.334**), and 1000 kernel weights (r = -0.349**) were found to be negative and significant. But this turned out to be positive and significant for hectoliter weight (r = 0.359**).

In 2017-18, the coefficients of correlation between grain yield vs. plant height (-0,292*), days to heading (-0,651**), days to maturity (-0,587**) turned out to be negative and significant whereas, these for grain yield vs. number of grain per spike (0,628**), number of plant

per unit area (0,267*), number of spikelet per spike (0,428**), grain weight per spike (0,543**) and 1000 kernel weights (0,126) were positive and most significant.

The coefficients of correlation between marketing price vs some quality traits were also inspected. The coefficients of correlations between marketing price vs 1000 kernel weight (0,202), hectoliter weight (0,478**) turned out to be positive whereas, these turned out to be negative for protein ration (%) (-0,102), sedimentation (%) (-0,271*), wet gluten 8%)(-0,282*), gluten index (%) (-0,064), energy value (W) (-0,445*), dough extension value (-0,319*). Regression relations between grain yields vs yield components were found to be significant. But the equations obtained from between grain yield vs yield components and marketing price vs quality traits, net return vs all characteristics with low coefficients of determination ($R^2$%) were regarded less reliable for grain yield estimations. The result of regression analysis also showed that higher yielding varieties generated higher net returns with high coefficient of determination ($R^2$ % = 92,5).

In 2018-19, the coefficients of correlation net return vs. plant height (-0.238*), number of days to heading (-0.631**), number of days to emergence (-0.608**), sedimentation (-0.229*), wet gluten (-0.426*), energy value (-0.303*), pressure value (-0.343) and dough extensibility value (-0.370*) were found to be negative and significant. The coefficients of correlation of among net return vs. grain number per spike$^{-1}$ (0.606**), number of spike$^{-1}$ unit area (0.235*), number of spikelet spike$^{-1}$ (0.441**), grain weight spike$^{-1}$ (0.537**) hectoliter weight (0.657**), yield (0.962**) and marketing price (0.657**) were found to be positive and significant. Regression equation between net income vs grain yield can be used for estimation with high coefficient of determination (92.5%). Other regression equations between net return vs marketing price (43.2%) and hectoliter weight (47.6%).

### Profitability (TL da$^{-1}$)

In 2016-17. Average net return of pure varieties was higher than that of mixtures with 629 TL da$^{-1}$ and 613 TL da$^{-1}$ respectively. Highest net return was obtained from Mixture 4 (30% Adana-99+ 50% Sagittario+ 20% Odeskaya) with 650 TL da$^{-1}$.

In 2017-18, Average net returns for mixtures (651, 82 TL da$^{-1}$ were higher than that of lean varieties (582, 49 TL da$^{-1}$). But, the highest net return was provided from pure variety of Dariel with a 861, 16 TL da$^{-1}$ Mixture of 45% Ceyhan-99+ 45%Dariel + 5% Sagittario+ 5% Kazak placed in the second rank with a 758, 07 TL da$^{-1}$.

In 2018-19, Average net return of lean varieties (1221 TL da$^{-1}$) was higher than that of mixtures (1215 TL da$^{-1}$). The highest net return was obtained from Mixture (15% Adana-99+ 20% Sagittario+40% Ceyhan-99+ 25% Kazak) with 1332 TL da$^{-1}$.

## Conclusion

The results revealed that mixture can compete with the lean varieties perfectly for grain yield, stability in grain quality, milling characteristics, dough properties, and suitability for palatable end products, marketing price and profitability [9-12].

2:2:1 sowing ratio of Dariel: Ceyhan-99: Sagittario (or any high-quality spring type or alternative variety) seems to be promising. Mixtures rise to be insurance for farmers against unstable and adverse weather conditions exposed often recently in the region.

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