

<http://www.pjbs.org>

**PJBS**

ISSN 1028-8880

**Pakistan  
Journal of Biological Sciences**

**ANSI***net*

Asian Network for Scientific Information  
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

## Seed Yield and Monetary Returns as Influenced by Pure Crop and Intercrops Grown in Association with Wheat

Rahmat Ullah Khan, Abdul Rashid, Ahmad Khan and Said Ghulam Khan  
Arid Zone Research Institute (PARC), D.I. Khan, Pakistan

### Abstract

Studies were undertaken at Arid Zone Research Institute, D.I. Khan during 1996-97 and 1997-98 to determine the effect of different intercropping combination viz., wheat + gram, wheat + rapeseed with pure crop of wheat, gram and rapeseed for maximum monetary returns. Data revealed that intercropping of wheat and gram sown in ratio of 1:1 and 3:1 gave significantly maximum seed yield and higher returns over traditionally sown pure crop of wheat, gram and rapeseed both the year respectively. This above intercropping combination of (1:1) and (3:1) increased the monetary returns 65, 37 and 5 per cent during 1997-98 while 162, 12 and 555 per cent during 1997-98 over sowing of pure crops of wheat, gram and rapeseed respectively.

### Introduction

In Pakistan, dry land farming contribute a substantial amount to the economy of agriculture. The rainfed areas, being a potential resource have not been explored efficiently due to mismanagement and traditional ways of farming. Wheat being a single largest crop of the rainfed areas contribute 12.5 percent of the national wheat production (Ali and Sharif, 1995) which is far less than the other wheat growing countries. There are many factors to be allowed for the crop improvement but one of the important factor which plays a pivotal role for crop improvement is suitable intercropping. Intercropping is popular among small scale farmers in tropical and subtropical environments. The limited resources and subsistence level of farming in Pakistan necessitates the practice of intercropping where it has received much attention as a means of improving crop yield and land usage. In this context, the processes which lead to the advantages and usual management practices to maximize benefits have been determined (Wahua and Miller, 1978) which implies the quantitative and qualitative estimations of characters of intercropped species. Many researchers, using cereal-cum-legume combinations, have studied yield and yield components of intercropped genotypes (Chandravanshi, 1975; Cordero and Mc Collums, 1979; Galal *et al.*, 1979; Singh and Doughal, 1967 and Rao and Willey, 1979). The multiplicity of possible plant combinations and the interaction in the crop mixtures have complicated the selection of an effective intercropping system (Narrang *et al.*, 1969). According to Perrin (1978), multiple cropping can be a useful component of cultural pest control, provided that it satisfies the farmer's socio-economic objectives.

Adawa (1985) reported that population of several pests decreased under conditions of plant species diversity. Risch (1941) found inter-cropping as a measure for the control of insect pests. An examination of 150 published field studies in which 198 phytophagous species were studied showed that 53 percent of the pest species were less abundant; 18

per cent were more abundant, 9 percent showed no difference and 20 percent showed a variable response in the intercropped crops. In Pakistan, no appreciable intercropping work has been done under the rainfed condition. However, for a given set of combination within a specific system, a method of arranging two crops for maximum yield benefits could be formulated.

Thus, the present study was designed to develop such a method, using wheat, chickpea and rapeseed in different sequence to determine the maximum monetary returns of intercroppings of wheat crop.

### Materials and Methods

Prior to seeding, soil samples were taken from the experimental sites for analysis. Results of the physical and chemical analysis of the soils are presented in Table 1. The fertilizer @ 20-50-0 NPK kg/ha was broadcast and incorporated into the soil, using a rotavator for incorporation. The different intercropping combination viz., wheat + gram, wheat + rapeseed with pure crop of wheat, gram and rapeseed were evaluated for maximum monetary returns. For these combination wheat c.v. Inqilab, for chickpea c.v. NIFA-88 and for rapeseed c.v. Shiralee were used at their recommended rate. The site received 256 mm and 221 mm rain prior to planting in the month of June to September. Meteorological data are reported in Table 2 a.b.

Table 1: Soil chemical and physical status of trial sites used in study.

Year	1996-97	1997-98
OM (%)	0.70	0.60
pH	8.20	8.30
NH <sub>4</sub> N (ppm)	0.04	0.03
P (ppm)	7.00	6.00
K (ppm)	-	-
Texture	Silty clay	Silty clay

Table 2(a): Meteorological data of the trial sites used in study.

Months	1996-97	1997-98	Seven year average* (1991-92 to 1997-98)
Oct.	15	86	21.29
Nov.	-	-	5.07
Dec.	9	4	9.14
Jan.	8	6	7.79
Feb.	-	15	15.00
Mar.	15	55	31.54
April.	69	39	36.35
Total	116	205	126.18

\* Mean monthly and long-term average precipitation(mm).

Table 2(b): Monthly mean temperature (°C)

Month	1996-97			1997-98		
	1	2	3	1	2	3
October	31	17	24	27	19	23
November	27	9	18	24	12	18
December	22	4	13	19	7	13
January	20	6	13	20	4	12
February	22	6	14	23	7	15
March	25	11	18	24	12	18
April	30	16	23	33	19	26

1 = Mean Maximum 2 = Mean minimum 3 = Mean

The experiment was laid out in Randomized Complete Block Design, with 4 replication and a plot size of 1.8 x 5 m (6 rows/plot). The crops were cut according to their maturity using the treatments as follows:

Treatment with crop combination:

- Pure wheat crop.
- Pure chickpea crop.
- Pure rapeseed crop.
- Wheat + chickpea (1:1).
- Wheat + chickpea (3:1).
- Wheat + rapeseed (1:1).
- Wheat + rapeseed (3:1).

Table 3: Yield of pure crops and intercrops grown with wheat during 1996-97

Treatments	Yield of pure crop (kg/ha)	Yield of intercrop (kg/ha)	Seed yield equivalent of wheat	Gross return (Rs/ha)
Wheat	1762.1	-	1762.1C	14977.9
Gram	1392.3	-	2129.4 BC	18099.9
Rapeseed	108.3	-	159.1 D	1352.4
Wheat + Gram [1:1]	1666.6	816.3	2915.1 A	24778.4
Wheat + Gram [3:1]	1524.3	782.7	2721.4 AB	23132.1
Wheat + Rapeseed [1:1]	2109.2	110.2	2271.3 ABC	19306.7
Wheat + Rapeseed [2:1]	1858.1	128.4	2046.9 BC	17398.8
LSD(0.05)	-	-	-	734.2

N.S:Non significant.

Figure followed by the similar word do not differ significantly; Plot were seeded on 06-11-97. Seed yield of Gram Rapeseed sown an inter-crop. with wheat converted into main crop (Wheat), based on market price for Rs/100 kg Wheat = 850; Chickpea 1300; Rapeseed = 1250

Seed yield data from all treatments were collected on four central rows in each plot and converted into pure crop of wheat to determine the suitable crop combinations for higher returns.

Data were analyzed using the analysis of variance (ANOVA) procedure and LSD (P < 0.05) values were calculated for comparisons among means (Steel and Torrie, 1980).

## Results and Discussion

**Yield of pure crops and inter-crops grown with wheat (1996-97):** Intercropping studies showed a significant different results over pure intercrops included in experiments. In case of wheat + gram intercropping growing of 1 row of wheat and 1 row of gram or 3 row of wheat and 1 row of gram proved to be superior over farmer's practice of planting pure crops. These combinations gave higher seed yield equivalent of wheat and monetary returns over pure crops and other intercrop combinations (Table-3).

This increase in seed yield was 1.7 to 1.5 folds over pure wheat crop. It appeared also profitable over pure crop of gram. Concerned to intercropping of wheat with rapeseed at the same ratio gave 14 to 13 fold seed increase over pure rapeseed crop. However all the intercropping combinations gave higher returns over pure crops but wheat + gram grown in a combination of (1 : 1) and (3 : 1) appeared significantly the best over pure crops as well as an intercrop (Table-3).

**Yield of pure crops and inter-crops grown with wheat 1997-98:** Similar to previous year, during 1997-98, crop sequence, wheat + gram intercropping, growing of 1 row of wheat and 1 row of gram or 3 row of wheat and 1 row of gram appeared the appropriate combination which gave 2.5 to 2.6 fold yield increase over solid wheat crop whereas at the same ratio growing of wheat and rapeseed increased the yield 3.5 and 3.0 fold over pure crop of rapeseed. However, all the intercrop proved to be superior and more profitable over traditional farming practice of growing pure crops but growing of wheat and gram

Table 4: Yield of pure crops and intercrops grown with wheat during 1997-98.

Treatments	Yield of pure crop (kg/ha)	Yield of intercrop (kg/ha)	Seed yield equivalent of wheat	Gross return (Rs/ha)
Wheat	1780.0	-	1780.0 C	12457.2
Gram	1944.6	-	4167.0 A	29169.0
Rapeseed	276.5	-	711.3 D	4979.1
Wheat + Gram [1:1]	1496.7	1425.9	4552.0 A	31865.4
Wheat + Gram [3:1]	1817.8	1376.8	4661.0 A	32626.3
Wheat + Rapeseed [1:1]	1944.1	208.8	2480.0 B	17368.4
Wheat + Rapeseed [3:1]	1512.0	260.4	2182.0 BC	15271.2
LSD(0.05)	-	-	-	548.3

N.S: Non significant. Figure followed by the similar word do not differ significantly. Plot were seeded on 06-11-97. Seed yield of Gram and Rapeseed sown an inter-crop with wheat converted into main crop (Wheat), based on market price for Rs/100 kg: Wheat = 700; Chickpea = 1500; Rapeseed = 1800.

said combinations gave significantly higher seed yield equivalent of wheat and monetary returns over pure crops and other intercropping combinations (Table-4). Intercropping studies of wheat as major crop with chickpea and rapeseed under rainfed conditions revealed that growing of wheat with chickpea at the combination of (1:1) and (3:1) recorded higher seed yield equivalents of wheat and maximum returns as compared to pure cropping under rainfed conditions.

The said combinations appeared more profitable over pure crops due to better production of chickpea with its market value both the year respectively.

## References

- Alvi, A.S. and M. Sharif, 1995. Arid Zone agriculture and research in Pakistan. *Progressive Farming*, 15: 5-12.
- Baliddawa, C.W., 1985. Plant species diversity and crop pest control. An analytical review: *Insect Sci. and Its Application*, 6: 479-487.
- Birch, H.F. and H.W. Doughal, 1967. Effect of legume on soil N mineralization and percent N in grasses. *Plant and Soil*, 27: 292-296.
- Chandravanshi, B.R., 1975. Studies on intercropping in soybean under uniform and paired row planting systems. *Proc. Intern. Workshop on Intercropping ICRISAT, India*, pp: 17-20.
- Cordero, A. and R.E. McCollums, 1979. Yield components of interplanted annual crops in South USA. *Agron. J.*, 71: 834-842.
- Galal, S., S. Hnidi, M.M. Abdalla and A.A. Metwally, 1979. Soybean and corn yield under different intercrop patterns. *World soybean Res. Conf. Raleigh, North Carolina*, II.69.
- Narrang, S.D., N.J. Kaul and G.S. Gill, 1969. Intercropping of maize with soybean, *Indian Farming*, 19:21-22.
- Perrin, R.M., 1978. Pest management in multiple cropping systems. *Agro-Ecosystems*, 3: 93-118.
- Rao, M.R. and R.W. Willey, 1979. Stability of performance of sorghum/pigeon pea intercropping. *Proc. Intern. Workshop on Intercropping, ICRISAT, India*.
- Risch, S.J., 1984. Intercropping as cultural pest control: Prospects and limitations. *Envir. Manag.*, 7: 9-14.
- Steel, R.G.D. and G.H. Torrie, 1980. *Principles and Procedures of Statistics*. McGraw Hill Book Co. Inc. New York.
- Wahua, T.A.T. and D.A. Miller, 1978. Relative yield totals and yield components of intercropped sorghum and soybean. *Agron. J.*, 70: 287-291.