

Economic Benefit of Interplanting Garlic Stems and its Effect to Resistant of Rapeseed

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ABSTRACT

In the middle and lower reaches of Changjiang River, the test of interplanting garlic stems in rapeseed field was made for five years, the result showed that rapeseed of interplanting garlic stems relative to monoculture rapeseed, its freezing injury, downy mildew, stem rot and splitting culms phenomenon dropped 5.68, 8.44, 5.12 and 3.36 percentage point, respectively. The yield of rapeseed was 3955.2 kg/hm² with interplanting garlic stems in rapeseed field, which increased yield 5.01% than that of monoculture rapeseed (3775.6kg). The total earnings of garlic stems and rapeseed in interplanting field was 20295.60 Yuan RMB per hm², and net profit 14354.10 Yuan RMB per hm², and may increase earning 10863.72 Yuan RMB than net profit of monoculture rapeseed (3490.38 Yuan RMB). The reason to obtain good economic benefit was that interplanting garlic stem utilized the residual space of early period of rapeseed growth and had bactericidal and disease resistance action, at the same time, spaced planting (1.5×10⁴ plants per hm²) of hybrid rapeseed gave play to dominance of nutrient and reproductive growth of rapeseed, their dominance got complementary, so best benefit was obtained in limited space.

Key words: rapeseed field—interplanting garlic—resistant—monoculture rapeseed

INTRODUCTION

In the middle and lower reaches of Changjiang River, much rainfall after spring made humidity greatly as well as higher temperature in field, which caused serious stem rot and resulted in dropping rapeseed yield greatly. The test indicated that the effect to control stem rot in full flowering period was best, but it was difficult to conduct in practice. For the question, while the research for raising yield and benefit in unit area was done (Liangjin Yang and Zonggyang Tang et al), from 1997, the test that interplanting garlic stems in rapeseed field was made for five years, garlic stems might come into market during spring Festival, as a result, not only the yield of rapeseed increased 4.76% than CK, net benefit increased 3.1 times, but also incidence of a disease in field reduced five to eight percentage point.

MATERIALS AND METHODS

Varieties and Condition

Zhongyouza No.2 was from Oil Crops Research Institute of Chinese Academy of Agriculture Sciences and Qinyou No.7 from Hybrid Rapeseed Research Center of Shaanxi Province, China.

The test following double harvest late rice was made in Wuhu county of Anhui province in China from 1997 to 2002, where lies in south bank of the middle and lower reaches of Changjiang river. Mean annual temperature was about 16 °C, mean annual amount of precipitation was 1169~1525mm, and mean annual hours of sunshine 2118h. Soil: lacustrine clay soil, pH 5.8, organic matter 27.6g/kg, whole N 1.54 g/kg, whole P 0.28g/kg, whole K 13.1g/kg, rapidly available P 5mg/kg, rapidly available K 68mg/kg.

Cultivation Measures

The time of sowing was on 20 to 30, August, and seed quantity was 3kg per hm² in seedling bed. Thinning was made in two to three leaves period, and finalizing of seedlings in four leaves period with 28-30 plants per m². Transplanting was done on 10 to 15, October with 13 to 16 leaves and 9 to 12 green leaves. 1.5 × 10⁴ plants per hm² were transplanted in field with 100cm × 66cm row spacing, and area rate between seedling bed and field was 1:30 or so. 180kg pure N and 11.25kg borax per hm² was as base fertilizer in which farm manure was 1/5 and N : P : K was 1 : 0.6 : 0.4. The fertilizer rate before transplanting and in seedling period and in winter and in spring was 5:3:1:1. Combining with preventing disease during early flowering season, ex-root

nutrition and a little trace elements was sprayed. There were 35-37 leaves on main stems of rapeseed during winter, in them there were 18 to 21 green leaves. Main stem had 58 to 60 leaves in the flowering, and in them there were 20 to 22 green leaves. To ditch for drainage and to control disease and pest should be done during growth season.

Test Methods

Comparison test in field In the two plots with same area in the same rice field, the comparison test between interplanting garlic stems in the row of hybrid rapeseed and monoculture hybrid rapeseed (CK) was made with same culture management method, and actual yield and benefit and resistant for five years were compared.

Comparison test among plots Treatment as above, plot area was 2.3m×25m, with three times repetitions and pairing arrangement. Character of sample plants were investigated in harvest, and disease and growth course of the fixed plants and spots were observed and recorded.

Interplanting methods Transplanting seedlings of hybrid rapeseed were made, at the same time two ditches whose width was 15 cm and depth 10cm in 100cm width row were ditched and their distance was 15cm, then sowed 30×10^4 germinated garlic stems per hm^2 in the ditch evenly, and covered high quality farm manure. The garlic stems would come into the market during the middle ten days of January.

RESULTS

Yield comparison between interplanting garlic stems and monoculture rapeseed in rapeseed

From the result of continuous 5a trials (table 1), the yield of rapeseed per hm^2 was 3955.2 ± 37.8 (CV 0.96%), the yield of monoculture rapeseed was 3766.5 ± 83.1 (CV 2.2%), the yield of interplanting increased $188.7\text{kg}(5.01\%)$.

Table 1. Comparison of rapeseed yield(kg) between interplanting garlic stems in rapeseed field and monoculture rapeseed

Seeding patterns	1997—1998	1998—1999	1999—2000	2000—2001	2001—2002	average
monoculture (CK)	3649.5	3760.0	3786.0	3880.5	3756.0	3766.5
interplanting (I)	3895.5	3933.0	3972.0	4026.0	3949.5	3955.2
I:CK±%	+246.0(6.74)	+172.5(4.59)	+186.0(4.91)	+145.5(3.75)	+193.5(5.15)	+188.7(5.01)

*the data in bracket were percentage of rapeseed yield increased of interplanting garlic stems than CK.

Economic benefit of interplanting garlic stems in rapeseed field

Interplanting garlic stems in rapeseed field, the width of the bed was 3m(including ditch), and in each bed there were three rows rapeseed and four rows garlic stems interplanted, the area for interplanting was about 50%. Actual yield of garlic stems per hm^2 was 6984.0kg and yield of rapeseed was 3955.2 kg, and net profit was 14354.10 Yuan RMB, which was 4.1 times than monoculture rapeseed (3490.38Yuan RMB)(table 2).

Table 2 Comparison of economic benefit between interplanting garlic stems in rapeseed field and monoculture rapeseed

Seeding patterns	Input Yuan RMB/ hm^2						Output Yuan RMB/ hm^2			Net benefit (Yuan RMB/ hm^2)	
	labour	seeds	fertilizer	pesticide	Mechanical cultivation	total	rapeseed	Garlic stems	total	amount	±%
Monoculture (CK)	1650.0	30.0	1275.50	227.50	450.0	3682.50	7172.88	—	7172.88	3490.38	100.00
Interplanting (I)	3000.0	825.0	1545.0	121.50	450.0	5941.50	7514.88	12780.72	20295.60	14354.10	411.25
I:CK±	+1350.0	+795.0	+270.0	-156.0		+2259.0	+342.00	+12780.72	+13122.72	+10863.72	+311.25

*the yield of rapeseed was average yield of 5a, average price of rapeseed and garlic stems were 1.90 and 1.83 yuan RMB/kg, respectively.

Effect of interplanting garlic stems to rapeseed resistant in rapeseed field

From table 3, the frozen damage and downy mildew and stem rot as well as splitting culms phenomenon dropped 5.68, 8.44, 5.12 and 3.36 percentage points, respectively, and garlic

stems may sterilize to improve environment of rapeseed growth. So interplanting garlic stems may create a good condition for increasing production and profit of rapeseed under ultra-low density planting.

Table 3 Comparison of rapeseed resistance between interplanting garlic stems in rapeseed field and monoculture rapeseed

year	seeding patterns	freeze damage	downy mildew	stem rot %	splitting culm
		rate% 18, Jan.	rate% 10, Mar.	14.Mar.	rate% 8.Apr.
1998-2002	Monoculture(CK)	23.78	26.92	20.9	10.5
5a'average	Interplanting(I)	18.1	18.48	15.78	7.14
value	I:CK ±	-5.68	-8.44	-5.12	-3.36

Yield composition factors of interplanting garlic stems in rapeseed field

Interplanting garlic stems in rapeseed field did not cause change of yield composition factors, whereas resistant was stronger, as a result, pods of single plant and pod grains and 1000-grain weight of single plant increased, thereby yield rose 5.01%. In addition, from the investigation of field, the average green leaf number of interplanting culture was 2.34 leaves more than monoculture rapeseed, and functional leaves increased 10.7%. It showed that interplanting garlic stems in rapeseed field might play germicidal and protective action to leaves.

DISCUSSION

Cultivated method with ultra-low density was used for hybrid rapeseed, its heterosis may be exerted well(Liangjin Yang al et and Liangjin Yang and Benru Xiao) with fitting development condition. For 5a trials, yield of hybrid rapeseed reached stable and high yield level (about 3900kg/hm²).

High yield culture with ultra-low density provided an approach of utilizing soil enough for symbiotic stereo culture of rapeseed and vegetable(Liangjin Yang), and the economic benefit per hm² was raised 10863.72 Yuan RMB, and it was 4.1times than monoculture rapeseed.

Interplanting garlic stems in rapeseed field create a sterilization environment, so that reducing rapeseed disease and increasing more green leaves, so promote its nutrition growth before winter and stabilize reproductive growth after spring. All these will play an important role for rapeseed balance growth and preventing premature decay and disease. It's physiology in cultivation and ecological law will be studied further.

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