GROWTH AND YIELD DETERMINATION OF SOYBEAN, MUNG BEAN, AND KIDNEY BEAN PLANTED BETWEEN COTTON ROWS

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Abstract: *this article presents findings from research investigating the growth, development, and yield formation of soybeans, mung beans, and kidney beans when intercropped with cotton.*

Keywords: *intercropping, cotton+soybean, cotton+mung bean, cotton+kidney bean, boll, bud, pod, planting scheme, planting dates, soil, cotton, seed.*

Summary of Results: Field experiments conducted over three years on the light gray soils of the Andijan region revealed significant effects of planting schemes and dates on the biometric indicators and yield of intercropped legumes, including soybeans, mung beans, and kidney beans. To simplify analysis, the growth, development, and yield of these legumes were studied separately based on crop type when intercropped with cotton.

In 2022, analyses conducted in the experimental field showed that the tallest soybean plants (91.6 cm) were observed in variant 11, where soybeans were planted alternately between rows before the first irrigation of cotton. This variant also recorded the highest biometric indicators: an average of 81.3 pods per plant, 3.1 seeds per pod, and a 1000-seed weight of 150.7 g (Table 1). In contrast, variants where legumes were planted simultaneously with cotton showed suboptimal results due to competition between crops.

The research concluded that the lowest biometric indicators for soybeans were observed in variants where soybeans were intercropped with cotton at the same time, highlighting the adverse effects of simultaneous planting on growth and yield.

Table 1

The growth, development, and yield of soybean crops planted as companion plants in cotton rows.

Variant №	Crop type	Planting scheme	Height, sm	pods, ps	Ps of grain per pod	Weight 1000 ps, gr	Yield, quintal (metric)
When legume intercrops are planted simultaneously with cotton							
2	cotton+ soybean	90X10-1, 90X20-1	84,7	79,1	2,5	148,7	9,2
5	cotton+ soybean	90X10-1, 180X(60X20)-1	90,2	80,0	2,6	149,0	11,4
When legume intercrops are planted before the first irrigation							
8	cotton+ soybean	90X10-1, 90X20-1	85,4	79,2	2,5	149,4	9,5
11	cotton+ soybean	90X10-1, 180X(60X20)-1	91,6	81,3	3,1	150,7	14,5

In **variant 2**, the soybean plants reached a height of 84.7 cm, produced 79.1 pods per plant, 2.5 seeds per pod, and had a 1000-seed weight of 148.7 g. However, the lowest soybean yield was also recorded in this variant, where soybeans were intercropped simultaneously with cotton in every row, amounting to only 9.2 quintals per hectare.

The **highest soybean yield** was obtained in **variant 11**, where soybeans were intercropped alternately between rows before the first irrigation of cotton. In this variant, an additional yield of 14.5 quintals of soybean was harvested alongside the cotton yield. This result can be attributed to the absence of adverse effects on the

growth and development of either crop during the growing season, as both the primary crop (cotton) and the intercrop (soybean) were able to coexist harmoniously.

Growth and Development of Intercropped Mung Beans

In the experiments, mung beans intercropped with cotton rows showed results similar to those observed with soybeans (Table 2).

The shortest mung bean plants were recorded in **variant 3**, where mung beans were planted simultaneously with cotton in every row, reaching a height of 57.2 cm.

Under the same agronomic conditions, mung beans planted alternately between rows (on ridges) achieved a slightly greater height of 59.1 cm.

Other biometric indicators followed a similar pattern:

Variant 3:

Number of productive branches: 4.1

Number of pods per plant: 51.3

Number of seeds per pod: 9.0

1000-seed weight: 54.2 g

Variant 6 (mung beans planted alternately between rows):

Number of productive branches: 7.9

Number of pods per plant: 52.1

Number of seeds per pod: 9.3

1000-seed weight: 55.1 g

Table 2

Growth and development companion legume crop (mung bean) planted between cotton rows.

Variant №	Crop type	Planting scheme	Height, sm	pods, ps	Ps of grain per pod	Weight 1000 ps, gr	Yield, quintal (metric)	Yield, quintal (metric)
When legume intercrops are planted simultaneously with cotton								
3	cotton+ mung	90X10-1, 90X20-1	57,2	4,1	51,3	9,0	54,2	8,2

	bean							
6	cotton+ mung bean	90X10-1, 180X(60X20)-1	59,1	7,9	52,1	9,3	55,1	9,8
When legume intercrops are planted before the first irrigation								
9	cotton+ mung bean	90X10-1, 90X20-1	58,4	6,2	51,5	9,2	54,1	8,4
12	cotton+ mung bean	90X10-1, 180X(60X20)-1	60,1	8,1	58,2	10,1	55,4	12,7

Field experiment results showed that the **best performance** of mung beans as an intercrop was observed in **variant 12**, where mung beans were planted alternately between cotton rows before the first irrigation. According to the analysis, mung bean plants in this variant reached a height of **60.1 cm**, produced **8.1 productive branches**, **58.2 pods per plant**, **10.1 seeds per pod**, and had a 1000-seed weight of **55.4 g**.

When examining mung bean yield, the **highest additional yield** of 12.7 quintals per hectare was also recorded in variant 12, aligning with the other growth parameters. In this setup, cotton and mung beans coexisted harmoniously, without adversely affecting each other's growth and development.

In contrast, the **lowest mung bean yield** was observed in variants where mung beans were planted simultaneously with cotton in every row. Here, the additional yield was only 8.2 quintals per hectare.

Growth and Development of Intercropped Beans

Field experiments included beans as another legume intercropped with cotton. The growth and development of beans were found to be consistent with those of soybeans and mung beans. However, the height of bean plants was slightly lower compared to soybeans and mung beans.

In **variant 4**, where beans were planted simultaneously with cotton in every row, the plants reached a height of **47.2 cm**. In the alternating row setup, their height

increased by **2.9 cm**.

In the second agronomic condition, where beans were planted after the first irrigation of cotton, improved growth and development were observed. In **variant 13**, where beans were intercropped alternately before the first irrigation, the plants reached a height of **53.0 cm**, and the number of productive branches was **5.6**.

The biometric indicators for **variant 13** were as follows:

- **Number of pods per plant**: 28.0
- **Number of seeds per pod**: 5.1
- **1000-seed weight**: 223.0 g

The yield of intercropped beans corresponded to these biometric parameters:

- **Variant 4**: 8.3 quintals per hectare
- **Variant 7**: 10.9 quintals per hectare
- **Variant 10**: 8.8 quintals per hectare
- **Variant 13**: 11.8 quintals per hectare

Based on the data obtained from the field experiments, it was concluded that considering the planting periods, the plant height and all other indicators were better in variants where legumes were planted before the first irrigation of cotton compared to those planted simultaneously with the main crop. Similarly, the number of pods per plant, the number of seeds per pod, and the 1000-seed weight were also superior in variants where companion crops were planted before the first irrigation of cotton.

Moreover, the yield followed the same trend, showing better results in the variants where companion crops were sown prior to the first irrigation.

When comparing planting methods, it was found that in the alternating row setups, both the growth and development of the main crop (cotton) and the companion crops, as well as their biometric indicators and yields, were better than in the variants where legumes were planted in every row. This improvement was attributed to the efficient operation of agricultural machinery and the timely and high-quality implementation of agronomic practices.

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