

3 2 [2, 4-6],  
 4,0-5,5 : - 4-6; - 4,5-5,0;  
 23% - 17-21% 23-25%, 20-  
 ( ). [3].  
 ( ) :  
 65-75%,  
 10-12 7-9 ( . 1).  
 2010 . 2000 . [1].

1.

	(1,2) *(3)		(1,2) *(3)			1
0	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>	N <sub>0</sub> P <sub>0</sub> K <sub>0</sub>
1	N <sub>60</sub> P <sub>60</sub> K <sub>90</sub>	N <sub>30</sub> P <sub>90</sub> K <sub>120</sub>	$\frac{N_{120}P_{120}K_{150}}{N_{30}P_{30}K_{30}^{**}}$	N <sub>90</sub> P <sub>120</sub> K <sub>150</sub>	$\frac{N_{300}P_{390}K_{510}}{N_{210}P_{300}K_{390}}$	$\frac{N_{60}P_{78}K_{102}}{N_{42}P_{60}K_{78}}$
2	N <sub>90</sub> P <sub>90</sub> K <sub>120</sub>	N <sub>45</sub> P <sub>90</sub> K <sub>120</sub>	$\frac{N_{150}P_{150}K_{180}}{N_{45}P_{60}K_{60}}$	N <sub>120</sub> P <sub>120</sub> K <sub>150</sub>	$\frac{N_{405}P_{450}K_{570}}{N_{300}P_{360}K_{450}}$	$\frac{N_{81}P_{90}K_{114}}{N_{60}P_{72}K_{90}}$
3	N <sub>120</sub> P <sub>120</sub> K <sub>150</sub>	N <sub>60</sub> P <sub>90</sub> K <sub>120</sub>	$\frac{N_{180}P_{180}K_{180}}{N_{60}P_{90}K_{90}}$	N <sub>150</sub> P <sub>120</sub> K <sub>150</sub>	$\frac{N_{510}P_{510}K_{600}}{N_{390}P_{420}K_{510}}$	$\frac{N_{102}P_{102}K_{120}}{N_{78}P_{84}K_{102}}$

\* 3-  
 \*\*

1 2-

3-

N<sub>42</sub>P<sub>60</sub>K<sub>78</sub> N<sub>78</sub>P<sub>84</sub>K<sub>102</sub>  
 55,3-178,5 %.

109-133

( 1 ) ( 2 )  
 (NPK) ( ):

/ 2 84-88 / 2 44-50  
 / 2 , 1,3-2,6 . ,

( ).

(

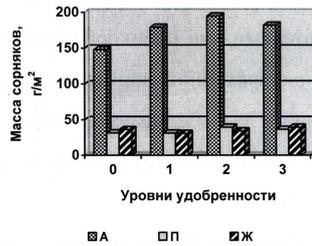
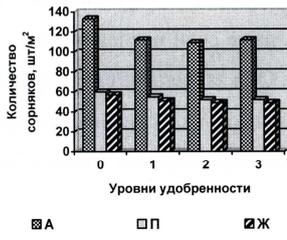
: - 50,9-57,1%, - 65,5-71,8%;  
 - 56,5-77,2%,  
 : 55,5-77,8%; 44,4-66,7%; 25,0-50,0%.

1  
 N<sub>60</sub>P<sub>78</sub>K<sub>102</sub> N<sub>102</sub>P<sub>102</sub>K<sub>120</sub>

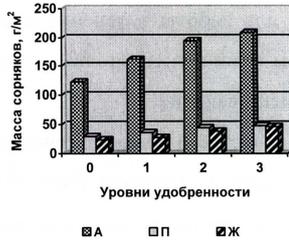
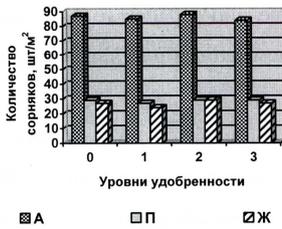
17,3-

24,0%, - 24,9-41,6 %.

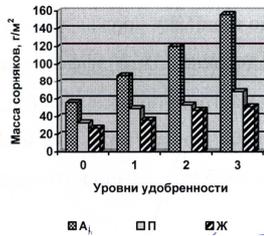
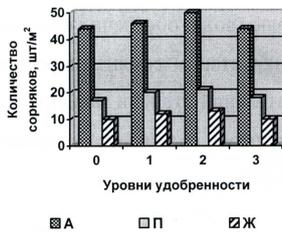
1-я ротация



2-я ротация



3-я ротация



1-

$$1 = 132,39 - 23,90(\text{NPK}) + 4,97(\text{NPK})^2 - 107,12 + 33,57^2 + 11,49(\text{NPK} \cdot \text{P}), R = 0,99$$

$$2 = 149,01 + 30,38(\text{NPK}) - 116,30 - 28,10(\text{NPK} \cdot \text{P}), R = 0,97.$$

2-

$$1 = 86,00 - 58,38 \cdot \text{P}, R = 0,99$$

$$2 = 120,56 + 10,38 \cdot (\text{NPK}) + 40,07(\text{NPK})^2 + 8,87 - 102,26^2 - 47,62 \cdot (\text{NPK} \cdot \text{P}), R = 0,96.$$

3-

$$1 = 44,28 + 13,87 \cdot (\text{NPK}) - 12,77(\text{NPK})^2 - 34,46 \cdot \text{P}, R = 0,99$$

$$2 = 53,70 + 93,07(\text{NPK})^2 - 23,67 - 65,90(\text{NPK} \cdot \text{P}), R = 0,98.$$

1,3-1,5,

2,5-2,7

1,8-2,1

3,0-4,9

38,9-41,5%,

44,9-46,9,

41,7-47,3%.

4,6-5,8

4,6-6,1

4,3-5,6

17,4-17,7

16,2-18,7%.

15,1-15,7 %

( . 2).

( . 3).

2.

1-3

	* ( + )												
	1			2			3			4			
	1	2	3	1	2	3	1	2	3	1	2	3	
0	25,8	25,2	15,7	2,31	2,47	2,48	0,78	0,94	1,02	2,31	2,60	2,52	
				3,38	3,43	3,00	1,23	1,35	1,20	3,39	3,58	3,08	
	1	28,8	30,7	19,3	2,44	2,67	2,69	0,90	1,06	1,12	2,49	2,69	2,77
					3,66	3,77	3,46	1,38	1,50	1,39	3,70	3,81	3,54
2		29,1	32,7	24,0	2,57	2,72	2,68	0,92	1,06	1,08	2,53	2,81	2,74
					3,90	3,96	3,55	1,43	1,54	1,37	3,89	4,05	3,63
	3	29,1	30,9	24,7	2,81	2,80	2,85	0,92	1,09	1,13	2,65	2,97	2,94
					4,06	4,26	3,96	1,39	1,65	1,50	3,92	4,43	4,06
0		28,7	30,0	20,1	2,31	2,43	2,18	0,78	0,90	0,89	2,30	2,59	2,17
					2,52	2,66	2,42	0,86	0,99	0,97	2,51	2,82	2,42
	1	31,4	36,8	27,9	2,48	2,65	2,32	0,93	1,02	0,94	2,47	2,75	2,33
					2,67	2,90	2,61	1,00	1,12	1,04	2,68	2,99	2,62
2		31,6	36,0	30,5	2,60	2,73	2,45	0,94	1,07	0,99	2,55	2,88	2,52
					2,86	3,04	2,74	1,04	1,18	1,08	2,82	3,19	2,79
	3	31,0	35,9	33,6	2,86	2,80	2,58	0,97	1,08	1,01	2,62	2,98	2,55
					3,10	3,14	2,94	1,04	1,20	1,11	2,81	3,31	2,88
0		28,9	30,3	20,0	2,29	2,40	2,23	0,75	0,97	0,93	2,31	2,57	2,22
					2,54	2,60	2,43	0,85	1,05	0,99	2,57	2,77	2,42
	1	34,0	37,8	28,0	2,48	2,63	2,34	0,90	1,04	0,96	2,49	2,76	2,38
					2,66	2,82	2,54	0,97	1,11	1,03	2,68	2,95	2,57
2		34,4	38,5	31,2	2,60	2,72	2,44	0,92	1,05	0,98	2,56	2,89	2,46
					2,81	2,97	2,69	1,00	1,13	1,06	2,78	3,09	2,70
	3	33,9	37,6	34,3	2,88	2,76	2,46	0,95	1,06	1,01	2,65	3,06	2,51
					3,12	3,06	2,79	1,03	1,17	1,08	2,90	3,36	2,75

\*

30,3-  
 41,0%, 11,4-13,3 17,8-24,8 %, 20,1-23,1  
 N<sub>60-102</sub> 35,0-38,2%.  
 P<sub>78-102</sub> K<sub>102-120</sub> 1 1,8-1,9 1,8-2,0  
 2,1-2,3  
 17,8 21,6 %, 12,0 14,6,  
 7,3 6,6 %.  
 ( . 3).  
 15,4%, 3,9 4,9%. 78,3-79,3 % N<sub>30-45</sub>  
 (N<sub>60</sub>P<sub>78</sub>K<sub>102</sub>) P<sub>90</sub>K<sub>120</sub>.  
 N<sub>60-90</sub> P<sub>60-90</sub> K<sub>90-120</sub> 60,1-64,2%.

3.

		( + ),%											
		N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	45,7	22,2	27,9	23,3	5,4	9,7	28,0	3,8	5,2	14,3	7,8	13,5
	2	45,7	21,1	30,4	21,7	6,2	12,5	41,6	6,6	10,8	21,8	10,0	25,2
	3	35,1	16,1	26,1	23,6	6,8	14,7	15,5	6,0	10,7	13,7	7,3	24,5
	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	56,0	27,8	30,6	48,8	10,0	21,1	67,0	10,6	15,4	52,3	21,8	55,3
	2	49,8	22,6	29,2	40,3	11,8	26,1	73,3	14,4	21,3	34,9	15,3	43,1
	3	50,5	21,3	31,5	29,2	8,6	18,0	68,0	16,7	27,6	32,6	14,8	53,7
	0	-	-	-	-	-	-	-	-	-	-	-	-
	1	64,2	30,7	33,3	49,6	11,4	22,9	78,3	13,6	16,8	60,5	25,5	64,9
	2	60,1	26,2	33,8	46,4	12,3	28,6	79,3	15,6	21,1	50,7	21,7	60,0
	3	54,3	22,7	32,7	28,5	8,1	32,1	68,7	18,0	25,2	41,2	17,9	66,3

1,4-2,1 1,4-2,1 1,2-2,4  
 2,8 3,6 1.  
 3,2 4,2 // -2000.- 4.- 15-16. 2.  
 3,3 4,8 // -2003.- 10.- 29-40. 3.  
 // -2010.- 3.- 8-10.  
 4. // -1976.- 1.-  
 58-64. 5. // -2007.- 3.- 68-77. 6.  
 ( )- . : , 1994.- . 21-24.

**COMPETITION OF CULTIVATED AND WEED PLANTS FOR NUTRIENTS IN A CROP ROTATION**

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*In a field crop rotation, the treatment with herbicides halved the content of weeds for 3 rotation cycles on the average, which decreased the consumption of nutrients by weeds: nitrogen by 4–6 times, phosphorus by 4.5–5 times, and potassium by 4.0–5.5 times. At the same time, the uptake of nutrients by crops increased by 23–25% for nitrogen, by 20–23% for phosphorus, and by 17–21% for potassium.*

*Keywords: removal of nutrients, weed plants, mineral fertilizers, rotation crops, nutritive efficiency of fertilizers.*