World Journal of Agriculture and Urbanization
Volume: 3 | No: 1 | Jan 2024 | ISSN: 2835-2866
https://wjau.academicjournal.io/index.php/wjau

Effects of Fertilizers Applied to Cotton on Soil Mineral Nitrogen after Repeated Cropping

L. A. Mirzaev, N. M. Ibragimov
Research Institute of Breeding, Seed Growing and Agrotechnology of Cotton Growing, Tashkent, Uzbekistan

N. N. Dmitriev, A. M. Zaitsev, O. L. Orifjonov, Sh. O. Oribjonov
Irkutsk State Agrarian University named after A.A. Ezhevsky, Irkutsk, Russia

Abstract: *In this article, it is based on the fact that in the Republic of Karakalpakstan, when different rates of mineral fertilizers are applied to cotton, which is planted after winter wheat and after repeated sunflower and bean crops, the ammonium form of nitrogen is more than the nitrate form in the 0-30 cm layer of the soil. Also, it is scientifically proven that in the areas where N60P80K60 kg/ha was applied to repeated mosh, the amount of mineral nitrogen was higher than N200P140K100 kg/ha for cotton.*

The natural humus reserve in the soil in the Central Asian region is rapidly decreasing due to factors such as the high average annual air temperature and the use of accelerated tillage methods to obtain a high yield from agricultural crops.

In addition to the above, factors such as deterioration of the reclamation of irrigated areas, intensification of deflation-erosion processes, densification of plowed and subsoil layers and pollution with various chemical means, as well as the fact that the practice of crop rotation is almost not used, and the constant violation of crop feeding procedures meets.

Among the mobile forms of nitrogen in the soil, nitrate and ammonium nitrogen forms are considered to be the most abundant, and their easy assimilation by plants is scientifically based in many literatures [3; 1; 4].

Nitrogen fertilizers applied to the soil quickly change from NH_4^+ to NO_3^-. Nitrates do not absorb into the soil, but dissolve well in water. In some studies, it was also observed that nitrates are washed into the lower or deep layers of the soil under the influence of precipitation and irrigation [5; 2; 6].

However, the effect of nitrogen fertilizers applied to cotton after repeated crops on the dynamics of mineral nitrogen in the soil has not been fully investigated. Therefore, the dynamics of the amount of mineral nitrogen in the soil during the growing season of cotton was studied in the research.

Field research was conducted in the conditions of the Republic of Karakalpakstan during 2014-2017.

The soil of the experimental field is an alluvial meadow that is irrigated from the skeet, humus in the plowed (0-30 cm) layer is 0.517 percent, total nitrogen, total phosphorus and potassium are proportionally 0.047 and 0.042 percent, from the mobile forms of nutrients $N\text{-}NH_4$ -10,7 mg/kg. $N\text{-}NO_3$ -7,1 mg/kg, P_2O_5-25 mg/kg and K_2O -120 mg/kg, the soil of the experimental field is poorly supplied with nutrients.

World Journal of Agriculture and Urbanization
Volume: 3 | No: 1 | Jan 2024 | ISSN: 2835-2866
https://wjau.academicjournal.io/index.php/wjau

The experiment on cotton was carried out in 3 repetitions, each version was 4.8 m wide, 20 m long, and the total area was 3456 m2.

In the experiment, alfalfa grown after winter wheat as a predecessor crop was fed at the rates of $N_{30-60}P_{80}K_{60}$ kg/ha and sunflower $N_{120-180}P_{80}K_{60}$ kg/ha. In research, cotton was fed with mineral fertilizers at the rate of $N_{160}P_{100}K_{75}$ and $N_{200}P_{140}K_{100}$ kg/ha. In this case, the experimental area was initially divided into the appropriate returns and variants and according to the experimental system, ammonium nitrate (34% N), suprephos (N-10%, P_2O_5-22-23%) and potassium chloride (60% K_2O) were applied.

In the research, all observations, analyzes and calculations on soil and plant samples were carried out according to the manuals " Методика полевых опытов" (Dospekhov, 1985), " Методика Государственного сорта испытания сельскохозяйственных культур" (1964), " Дала тажрибаларини ўтказиш услублари" (2007).

The general and mobile forms of humus, nitrogen, phosphorus and potassium elements in the soil were determined according to the methods " Методы агрохимических, агрофизических и микробиологических исследований в поливных хлопковых районах" (1963) and " Методы агрохимических анализов почв и растений Средней Азии" (1977).

According to the obtained data, it was noted that ammonium form of nitrogen was more abundant than nitrate form in soil layers in all growth phases of cotton. In particular, in the options where cotton is planted as a predecessor crop in the period of 2-4 true leaves with mash (at the rate of $N_{30-60}P_{80}K_{60}$ kg/ha of fertilizer), when it is fed with mineral fertilizers at the rate of $N_{160}P_{100}K_{75}$ kg/ha, mineral nitrogen ($N\text{-}NH_4$ + $N\text{-}NO_3$) in the 0-30 cm layer of the soil were 15.5+10.8 and 15.8+11.3 mg/kg, and when fed with $N_{200}P_{140}K_{100}$ kg/ha it was 16.4+11.0 and 17.0+12.1 mg/kg.

Also, after sunflower ($N_{120-180}P_{80}K_{60}$ kg/ha) as a repeated crop, cotton $N_{160}P_{100}K_{75}$ and $N_{200}P_{140}K_{100}$ kg/ha were fed, and mineral nitrogen in the soil decreased (10.6+9.7 and 11.0+10.4 mg/kg; 13.6+10.4 and 14.0+11.4 mg/kg).

The highest indicators of mineral nitrogen accumulation in the soil are observed during the periods of cotton combing and flowering, which can be attributed to the fact that mineral fertilizers were applied in the cotton fields during this period.

During the flowering and fruiting period of cotton, in the case of fertilizing the previous crop with $N_{30-60}P_{80}K_{60}$ kg/ha, while feeding cotton with mineral fertilizers at the rate of $N_{160}P_{100}K_{75}$ kg/ha, mineral nitrogen accumulated in the 0-30 cm layer of the soil is 26.5+22.3 and 28.2+ 24.6 mg/kg, it was observed that 1.7 + 1.4 and 1.8 + 1.4 mg/kg were higher when cotton was fed with $N_{200}P_{140}K_{100}$ kg/ha and lower rates of $N_{160}P_{100}K_{75}$ kg/ha.

Amounts of mineral nitrogen forms in the soil after repeated crop-sunflower ($N_{120-180}P_{80}K_{60}$ kg/ha) in cotton grown in different amounts of mineral nutrition in the next year $N_{160}P_{100}K_{75}$ (26.3+21.6 and 26.0+22.3 mg/kg) and $N_{200}P_{140}K_{100}$ (27.7+22.1 and 28.0+23.7 mg/kg) kg/ha, and the lack of experience compared to options 1-4 can be attributed to the types of crops (table).

Table

Amounts of mineral nitrogen in the soil layer (0-30 cm), mg/kg (2015)

Option order	Mineral fertilizer applied to the previous crop, kg/ha	Mineral fertilizer applied to cotton, kg/ha	$N\text{-}NH_4$				$N\text{-}NO_3$			
			05. VI	10. VII	25. VII	14. IX	05. VI	10. VII	25. VII	14. IX
1	Bean $N_{30}P_{80}K_{60}$	$N_{160}P_{100}K_{75}$	15,5	22,7	26,5	12,3	10,8	20,5	22,3	10,5
2		$N_{200}P_{140}K_{100}$	16,4	27,0	28,2	12,7	11,0	22,5	23,7	11,2

3		$N_{240}P_{170}K_{125}$	15,5	28,0	27,3	14,2	12,1	24,1	25,0	11,6
4	Bean $N_{60}P_{80}K_{60}$	$N_{160}P_{100}K_{75}$	15,8	24,5	28,2	14,0	11,3	21,4	24,6	11,4
5		$N_{200}P_{140}K_{100}$	17,0	27,6	30,0	13,3	12,1	23,2	26,0	12,8
6		$N_{240}P_{170}K_{125}$	18,5	28,6	30,2	14,0	12,5	24,9	27,3	11,0
7	Sunflower $N_{120}P_{80}K_{60}$	$N_{160}P_{100}K_{75}$	10,6	21,3	26,3	11,2	9,7	19,2	21,6	9,2
8		$N_{200}P_{140}K_{100}$	13,6	25,6	27,7	11,9	10,4	20,8	22,1	9,6
9		$N_{240}P_{170}K_{125}$	16,5	27,0	25,7	13,2	10,6	22,4	25,5	10,0
10	Sunflower $N_{180}P_{80}K_{60}$	$N_{160}P_{100}K_{75}$	11,0	22,7	26,0	12,4	10,4	20,7	22,3	10,0
11		$N_{200}P_{140}K_{100}$	14,0	26,8	28,0	12,4	11,4	21,4	23,7	10,4
12		$N_{240}P_{170}K_{125}$	15,9	27,3	24,2	12,7	10,8	23,0	25,1	10,0

In the southern parts of the Republic of Karakalpakstan, in areas where sunflowers and beans have been repeatedly grown, cotton is planted next year and mineral fertilizers are applied based on scientific and practical recommendations.

A short rotation cropping system is an effective practice in maintaining soil fertility, with beans recommended to be planted after winter wheat as a successor crop to cotton.

REFERENCES

1. Ибрагимов Н.М. Органик ўғитлар ва тупроқдаги минерал азотнинг динамикаси// Ж. Пахтачилик. – Ташкент, 1998. - № 1. - 24-27 б.
2. Ибрагимов Н.М., Мирзаев Л.А. Продуктивность подсолнечника в повторном посеве в зависимости от удобренности предшественника. Тупроқшунослик-мамлакат экологик ва озиқ-овқат хавфсизлиги хизматида. Республика илмий-амалий анжумани мақолалари тўплами. Тошкент, 2017, с. 209-211
3. Рискиева Х.Т. Азот в почвах зоны хлопкосеяния Узбекистана. – Ташкент: Фан, 1989. – 147 с.
4. Мирзажонов Қ.М., Нурматов Ш.Н., Исаев С.Х. Эрозияга учраган тупроқларда азотли ўғитларни самарадорлиги. Ўзбекистон қишлоқ хўжалиги журнали. 2011 йил, №6., 32-бет.
5. Яровенко Г.И. Физиолого-агрохимические основы повышения эффективности азотных удобрений в хлопководстве. – Ташкент: Узбекистан, 1969. – 282 с.
6. Kienzler K. Improving the nitrogen use efficiency and crop quality in the Khorezm region, Uzbekistan. Ph.D. Thesis, Rheinischen Friedrich- Wilhelms-Universität Bonn, ZEF, Bonn. 2009.