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Assimilation area of the new variety of Tarona rice, depending on the level of nitrogen nutrition at different rates of seed sowing in the soil conditions of the Tashkent region

Kalandarov B.I.

Abstract— **The article presents the results of scientific studies on the formation of leaf area of rice varieties Tarona, depending on the application dose of nitrogen fertilizer at different seeding rate in the Tashkent region of Uzbekistan.**

Index Terms— **leaf area, doses of nitrogen fertilizer, seeding rate.**

I. INTRODUCTION

A leaf is an important over ground organ of a plant that performs such important functions as transpiration of water and assimilation of carbon dioxide from the air by photosynthesis. It is known that one of the most important indicators of the photosynthetic activity of plants that affect the synthesis and formation of elements of the crop structure is the size of the leaf area. In the introduction of new varieties of rice in production in order to increase grain productivity, it is necessary to develop agrotechnical methods of cultivation, such as seeding rates and the introduction of mineral fertilizers, including nitrogen fertilizers, taking into account the physiological state of plants. To successfully solve this problem, it is first of all necessary to know what effect the level of nitrogen nutrition has in the various density of standing on the above-ground organs of plants. In particular, the formation of the area of the sheet.

A number of works by researchers (N.F. Konyaev, 1970, B.I. Gulyaev, 1996, R.R. Jamirze, 2009) are devoted to studying the leaf area on the productivity of plants and the formation and yield of rice. In the studies of M.Y.Hayitov and B.I.Kalandarov (2015) studied the relationship of the leaf area to the productivity of plants in different varieties of rice in the conditions of the Tashkent region. However, in the Tarona variety, this issue was not studied.

Therefore, to theoretically substantiate the level of nitrogen nutrition, it seemed advisable to determine the effects of increasing nitrogen rates in different plant densities on the formation of the assimilating area of the new variety of Tarona rice.

II. MATERIALS AND METHODS

Experience was laid in 2012-2014 in the experimental section of the Uzbek Rice Research Institute (41°11'16" N, 69°20'07" E). The soil of the experimental site is meadow-marshy, non-saline, neutral (pH-6.8-7.1). The crop previous to rice was soybean. The soil parameters before the experiment were as follows: 0.27-0.31% total nitrogen, 0.17-0.21% available phosphorus, 0.7-0.8% available potassium, 1.6% organic matter content. Variety of Tarona rice is one of the new late-ripening varieties bred by breeders of the Uzbek Rice Research Institute. The method of allocation of the plots is system. Repeat fourfold. The area of the plots is 20 m^2 (4 x 5 m), accounting - 12 m^2. The seeds were sown in a dispersed method with pre-soaked seeds. To create a different density of plant standing, the seeds were sown in three seeding rates 400 (132 kg ha^{-1}), 500 (165 kg ha^{-1}) and 600 (198 kg ha^{-1}) pieces of seeds per square meter. Nitrogen fertilizers contributed 0, 90, 120, 150, 180, 210, 240 kg per hectare. In the form of nitrogen fertilizer, ammonium sulfate was added, in the form of phosphorus fertilizer superphosphate and in the form of potassium fertilizer potassium chloride. The norms and terms of fertilizer application are given in Table-1.

Table 1. Norms and deadlines application of fertilizers

Treatment	Basal kg ha $^{-1}$	MT kg ha $^{-1}$	PI kg ha $^{-1}$
0 (control)	-	-	-
$\mathbf{N_{90}P_{120}K_{150}}$	$N_{30}P_{120}K_{75}$	$N_{30}P_0K_0$	$N_{30}P_0K_{75}$
$\mathbf{N_{120}P_{120}K_{150}}$	$N_{40}P_{120}K_{75}$	$N_{40}P_0K_0$	$N_{40}P_0K_{75}$
$\mathbf{N_{150}P_{120}K_{150}}$	$N_{50}P_{120}K_{75}$	$N_{50}P_0K_0$	$N_{50}P_0K_{75}$
$\mathbf{N_{180}P_{120}K_{150}}$	$N_{60}P_{120}K_{75}$	$N_{60}P_0K_0$	$N_{60}P_0K_{75}$
$\mathbf{N_{210}P_{120}K_{150}}$	$N_{70}P_{120}K_{75}$	$N_{70}P_0K_0$	$N_{70}P_0K_{75}$
$\mathbf{N_{240}P_{120}K_{150}}$	$N_{80}P_{120}K_{75}$	$N_{80}P_0K_0$	$N_{80}P_0K_{75}$

Timing: basal = 14 day after germination, MT = mid tillering stage, PT = panicle initiation stage

Leaf area (LA) was calculated by the formula (Bhan, V.M. and Pande H.K., 1966)

$$S = L \times H \times 0{,}802 \text{ sm}^2,$$

Where, S = area of leaves, (cm^2); L = length of leaves, (cm); H = leaf width, (cm); 0,802 = correction factor for calculating leaf area.

III. RESULTS AND DISCUSSION

The nature of the formation of the leaf area of a single plant depends on the doses of nitrogen fertilizers and the rates of seed sowing. With increasing seed sowing rates, the leaf area of individual plants decreases (Fig. 1). High density of plants reduces the amount of light, which increases the height of plants and reduces the area area of leaves (P.I. Kostylev, A.A. Redkin, 2016). Since the Tarona variety increased the seeding rates from 400 pieces/m^2 to 600

Kalandarov B.I., Doctoral student scientific and research institute of rice growing. Uzbekistan. Tashkent region

pieces/m^2, the leaf area of one plant was reduced from 264-325 cm^2/plant to 251-259 cm^2/plant. In this case, the maximum value (325 cm^2/plant) of the leaf area of one plant was formed in the rate of application of mineral fertilizers $N_{240}P_{120}K_{150}$ at a seed rate of 400 pieces/m^2, the minimum value was observed in the norm of applying mineral fertilizers $N_{90}P_{120}K_{150}$ at a seed rate of 600 pieces/m^2.

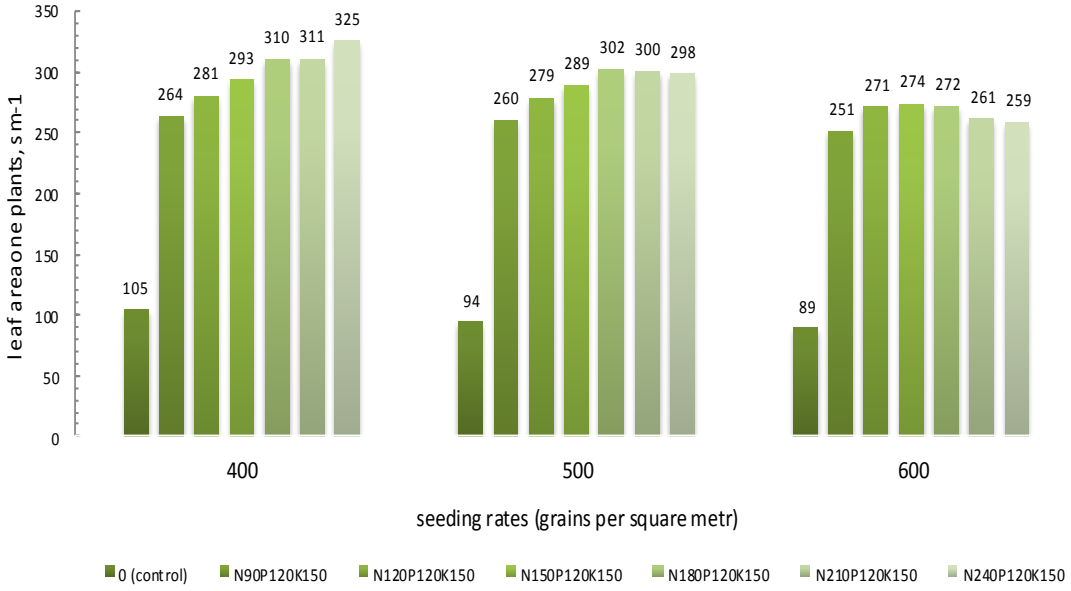

Fig. 1. The area of leaves of the Tarona rice variety, depending on the norms of nitrogen fertilizers at different rates of seed sowing.

Leaf area of individual plants increased with increasing doses of nitrogen fertilizer (Fig. 2). In particular, with increasing doses of nitrogen fertilizers from N_{90} to N_{240} at a seed rate of 400 pieces/m^2, the leaf area increased to 325 cm^2/plant. However, at a seed rate of 500 pieces/m^2, this indicator increased (302 cm^2/plant) to N_{180} and variants N_{210} and N_{240} decreased (298 cm^2/plant). This pattern was partially observed in the norm of sowing seeds of 600 pieces/m^2.

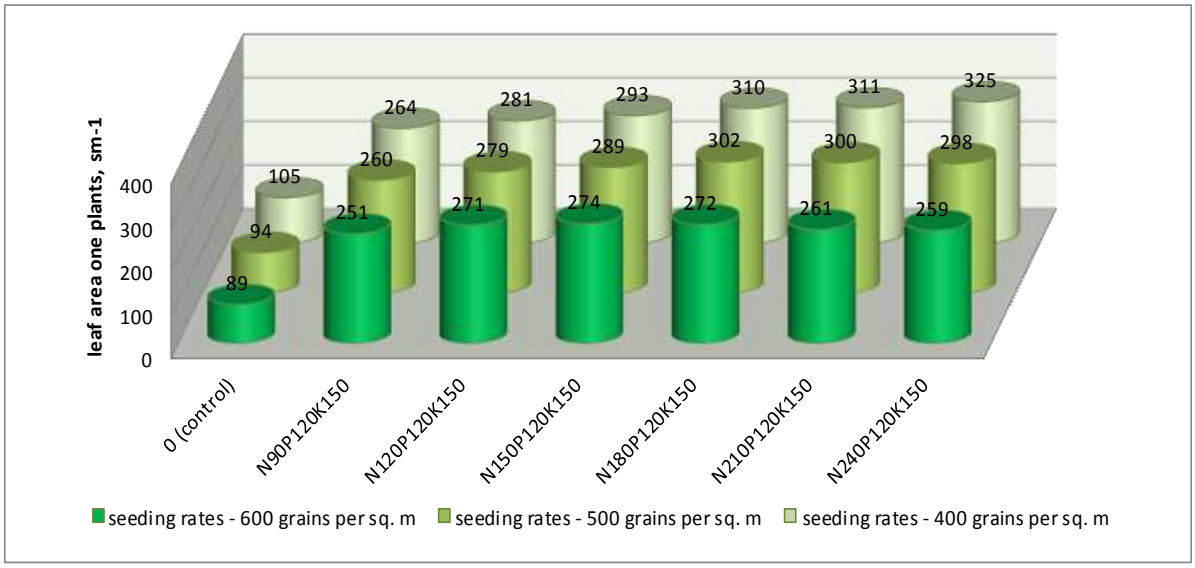

Fig. 2 Variation in the value of the leaf area of the Tarona rice variety, depending on the rates of seed sowing and nitrogen fertilizers.

From the above, it can be concluded that in the Tarona variety, with increasing doses of nitrogen fertilizers up to N_{240}, the leaf area of a single plant increases with the rate of seed sowing and decreases with a thickening of the plant density.

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