



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research
Vol. 15, Issue, 01, pp.23410-23411, January, 2023
DOI: <https://doi.org/10.24941/ijcr.44738.01.2023>

**INTERNATIONAL JOURNAL
OF CURRENT RESEARCH**

RESEARCH ARTICLE

NET ASSIMILATION RATE OF WHEAT CROP UNDER DIFFERENT IRRIGATION MANAGEMENT PRACTICES IN ASSAM

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ARTICLE INFO

Article History:

Received 11th October, 2022
Received in revised form
15th November, 2022
Accepted 14th December, 2022
Published online 30th January, 2023

Key words:

Net assimilation Rate, yield, Irrigations,
Upland, Medium Land, Photosynthetic
efficiency.

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Citation: Kalita, M.C. and Kalita, A. 2023. "Net assimilation rate of wheat crop under different irrigation management practices in Assam". *International Journal of Current Research*, 15, (01), 23410-23411.

ABSTRACT

A field trial was conducted in 1995-96 at AAU, ICR farm to know the effect of irrigation management practices on wheat crop. It is important for cereal crop like wheat that longevity of leaves is important and retention of a large leaf surface area; which can carry on photosynthesis till the completion of maturity of a plant. NAR become higher during vegetative phase to flowering and declines rapidly as growth progressed in wheat crop. Two irrigations @6cm depth at CRI and Flowering stages were found to be the optimum in Assam under both the land situations

INTRODUCTION

Wheat is the main cereal crop of India and the Total area under this crop is more than 29.5 million hectares. The production of wheat in the country has increased significantly from 75.81 million MT in 2006-07 to an all time record high of 109.52 million MT in 2020-21. Wheat crop needs at least 2-5 numbers of post sowing irrigations depending on the availability of winter rainfall and Ground watertable conditions. Net assimilation rate(NAR) of wheat crop was influenced by the irrigation regimes under different land situations. It gives the measurement of photosynthetic efficiency of plants. It is depth assimilatory apparatus. Thus, net photosynthesis is equal to Gross photosynthesis minus respiration of that same plant. Longevity of leaves is also important and retention of large leaf surface area able to carry on photosynthesis till the completion of maturity of a plant. Keeping this points in view; the present study was taken to know the NAR activity of wheat crop under different irrigation management practices in Assam.

MATERIALS AND METHODS

A field experiment was conducted during the winter seasons, 1995-96 at Assam Agricultural University, Jorhat. The soil of the experimental site was Inceptisols and is derived from the alluvial deposits of the river Brahmaputra. The soil was sandy loam in texture and acidic in reaction with p^H -4.85 and 4.90 under Upland and Medium land

situations. The fertility status as found low to medium in respect of available Nitrogen, Phosphorus and Potash content of soil in that surrounding areas. The climate of Jorhat is sub-tropical humid climate with average annual rainfall of 2,000mm rainfall. Out of this 26.40% rainfall was received in March to May; 59.29% rainfall was received during June to September and 19.20% was received in post monsoon period (September to November). Only 3.5% winter rainfall was being received during December to February in the ensuing crop growing period. The maximum temperature raises up to 38°C during July-August and minimum falls to 7°C during January. The land was ploughed by tractor drawn disc plough and harrowed twice to obtain fine tilth condition. Fertilizer dose of 80-46-30kg/ha of N,P₂O₅ & K₂O was followed for wheat crop. Application of fertilizer was followed as per the guidelines of AAU, package of Practices. Seeds of wheat (cv-Sonalika) were sown on 9th November, 1995 at ICR farm, AAU. The seeds were uniformly sown in furrows, 20cm apart at a depth of 5-6cm and covered with soil. The Seed rate was 120kg/ha. An irrigation depth of 6cm was maintained during the period of irrigations at CRI, Heading and Grainfilling stages of wheat crop. The experiment was conducted under the two different land situations viz-Upland and Medium land with seven numbers of treatments viz-T₁(rainfed), T₂ (one irrigation of 4cm depth at CRI stage), T₃(Two irrigations of 4cm depth at CRI & Heading stage), T₄(Three irrigations of 4cm depth at CRI, Heading & Grain filling Stage), T₅(one irrigations of 6cm depth at CRI), T₆(Two irrigations of 6cm depth at CRI & Heading stage) and T₇(Three irrigations of 6cm depth at Radford(1967). Which is described as follows:

$$\text{NAR} = 1/A \times dw/dt; \text{gm/cm}^2/\text{day}$$

dt = difference between time at two stages. A= difference between leaf area at two stages.

RESULTS AND DISCUSSION

Net assimilation rate of wheat crop at different stages of crop growth was influenced by the irrigation regimes under Upland and Medium land situations. Under Upland situation, at CRI stage, the highest NAR was recorded by the treatments T4 (0.032g/cm²/d), T6(0.031g/cm²/d), and T7 (0.032g/cm²/d) and they were significantly superior to rest of the treatments. This was followed by the treatments T5 (0.027g/cm²/d), T3(0.027g/cm²/d) and T2(0.026g/cm²/d); all being at par but significantly superior to T1(0.015g/cm²/d). In 1995-96, under at par with all the treatments, except the rainfed treatment, T1(0.020g/cm²/d). At the heading stage, under upland situation during 1995- 96, the highest NAR was recorded by the treatment T7(0.170g/cm²/d) being at par with T4 (0.168g/cm²/d), T6(0.165g/cm²/d), and T5((0.162g/cm²/d) but significantly superior to rest of the treatments. Under the Medium land situation in 1995-96, the and T4(0.158g/cm²/d) but significantly superior to rest of the treatments. T1 treatment recorded 0.099g/cm²/d being significantly superior to rest of the treatments. At the grain filling stage, under Upland situation during 1995-96, the highest NAR was recorded by the treatment T7(0.198g/cm²/d) being at par with T6(0.190g/cm²/d), T4(0.189g/cm²/d) and T5(0.182 g/cm²/d) but significantly superior to rest of the treatments. Lowest NAR at grain filling stage was recorded by the treatment T1(0.136 g/cm²/d). Under Medium land situation, the highest NAR at grain filling stage was recorded by the treatment T7(0.210g/cm²/d) being at par with T6(0.208g/cm²/d) and T4(0.207g/cm²/d) but significantly superior to rest of the treatments.

At the maturity stage, during 1995-96, the highest NAR under Upland situation was recorded by the treatment T7(0.164g/cm²/d) being at par with T4(0.163g/cm²/d), treatments. Under Medium land situation, during 1995-96 the highest NAR was recorded by the treatment T7(0.187g/cm²/d) being at par with T6(0.178 g/cm²/d) and T4(0.158g/cm²/d) but significantly superior to rest of the treatments. Lowest being recorded by the T1 treatment(0.135g/cm²/d). Under both the land situation of wheat crop under Assam situation, NAR increased with the application of two irrigations of 6cm depth at CRI to booting stage in that experimental period. NAR become higher during vegetative phase to flowering and declines rapidly as growth progressed in wheat. Similar findings were also obtained by han et.al, 2005.

CONCLUSION

Crop growth and Net assimilation rate were influenced with the increasing intensity of irrigation water under Upland situation. But the rate is declining after attaining the maturity stage. Two irrigations@6cm depth at CRI and Flowering stages were found to be optimum under Upland and Medium land situation. But if the dryness occurs above the surface soil of crop than three numbers of irrigations@ 6cm depth will be the optimum under Upland situation. This management practice together with application of recommended dose of N-P-K fertilizer will definitely enhance both NAR activity and crop yield of wheat crop in Assam situation.

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