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Full Length Research Paper

The effect of nitrogen and potassium fertilizer on yield, quality and some quantitative characteristics of flue-cured tobacco cv.Coker347

Ali Reza Farrokh[1]*, Ibrahim Azizov[2], Atoosa Farrokh[3], Masoud Esfahani[4], Mehdi Rangbarchobeh[5] and Masoud Kavoosi[6]

[1]Young Researchers Club, Rasht Branch, Islamic Azad University, Rasht, Iran.
[2]Department of Botany, National Academy of Science, Republic of Azerbaijan.
[3]Department of Agriculture, Islamic Azad University, Qazvin Branch, Iran.
[4]Department of Agriculture, University of Guilan, Iran.
[5]Department of Agronomy, Tobacco Research Institute, Rasht, Iran.
[6]Scientific Board of Rasht Rice Research Institute, Iran.

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In order to investigate the effect of nitrogen and potassium fertilizers on yield, quality and some quantitative characteristics of flue-cured tobacco cv.Coker347, 2 years experiment was carried out in Tobacco Research Institute of Rasht city located in Guilan province on factorial based using a factorial experiment with 8 treatments and 3 replications. The applied fertilizer levels included 35(N1), 45(N2), 55(N3) and 65 (N4) Kg N/ha as pure nitrogen and potassium in two levels of 150 (K1) and 200 (K2) Kg K/ha potassium as potassium sulphate. The measured parameters in this experiment included leaf yield, stem height, stem diameter, number of leaves, leaf length, leaf width, stem dry weight, biomass, flowering, nicotine and sugar content. The highest of leaf yield, plant height, leaf number were obtained by using 55 and 65 Kg N/ha. The highest amount of stem diameter, stem dried weight and biomass obtained when 55 Kg N/h was applied. The greatest leaf length belonged to usage of 45, 55 and 65Kg N/ha. The longest flowering period was gotten when 65 Kg N/ha was utilized. The maximum dried leaf yield, stem height, stem sickness, leaf number, leaf length, stem dried weight and biomass belonged to 200 Kg K/ha level and the highest nicotine percentage was detected when 150 Kg K/ha was used. 65 Kg N/ha and 200 Kg K/ha level had the highest amount of dried leaf yield. The greatest number of leaves and leaf length were associated with using 55 Kg N/ha and 200 Kg K/ha as well as using 65 Kg N/ha and 200 Kg K/ha. Applying 65 Kg N/ha and 200 Kg K/ha, 55 Kg N/ha and 150 Kg K/ha indicated the highest amount of biomass. Utilizing 150 Kg K/ha in fist year led to the longest flowering period.

Key words: Nitrogen, potassium, yield, quality, flue-cured tobacco.

INTRODUCTION

In comparison with other plants, tobacco is counted among rather new crop and after its discovery in Central America, smoking became widely prevalent all around the world. Despite the unpopularity of smoking among people of the world, tobacco is still one of the valuable industrial and agricultural products. Tobacco has key role on economy of producer countries and the revenue earned from this industry is an important part of the national income. Every day, millions of people are occupied directly or indirectly in cultivation, production industry and transaction of tobacco all around the world (Sadeghi, 2007).

Generally, tobacco quality would be determined by the type and amounts of elements in existent compounds of

*Corresponding author. E-mail: ar_farrokh274@yahoo.com.

tobacco as well as relations and interactions between them. These chemical determine the economical and hygienic importance of tobacco and its different productions. Evaluation of leaf quality depends on relative concentration of various organic compounds such as total alkaloids and reductive sugars (Meiner and Tuker, 1990). Nitrogen is one of the basic growth elements and directly impacts on tobacco growth and development (Shamel Rostami, 1995). Nitrogen is a basic part of most compounds in tobacco. The balanced content of nitrogen leads to an increase in crop yield and does not have undesirable effect on tobacco quality. Although, an excessive amount of nitrogen increases the crop yield to some extent, too much nitrogen compounds have negative influence on tobacco quality. Studies indicate that nitrogen fertilizer consumption increases crop production and nitrogen compounds but using excessively not only does not have any significant effect on yield but also decreases the quality. Some reports stated that nitrogen usage affects tobacco nitrate amounts (Sazgar, 1991).

Nitrogen is the composing part of all proteins, chlorophyll and enzymes, and has influence on material metabolism of soil (Mahmoudi and Hiakimian, 1998). Existing nitrogen in adenosine triphosphates plays a key role to transfer energy. At the primary stage of plant growth and development which includes cell division and elongation time, presence of enough nitrogen in leaves is very important and determines the final leaf area (Shamel Rostami, 1997). Earth layer and agronomic soil contain around 2.3 and 1.4% K_2O, respectively, which is a significant quantity compared to other main elements. Among plants requiring cations, Potassium is the biggest cation regarding its 1.33 engestrum atomic radius. K-O bond is not very stable because 8-14 molecules surround it (Salardini, 2006). Potassium is one of the main elements which do not have any influence on organic compounds like protoplasm, lipids and cellulose but it is counted as an important catalyst for more than 40 basic enzymes reaction (Sarmadnia and Kochaki, 1995).

Potassium in proper amount is not only is useful for growth but also necessary for tobacco quality. More potassium content leads to its bonding with organic acids and better tobacco burning quality (Sadeghi, 2007). Potassium is even able to neutralize the negative effects of some elements like chloride in tobacco burning quality. It seems as though potassium is an important element in formation of starch and sugar in tobacco. Excessive amount of potassium and sugar in tobacco is usually fermented and consequently leads to better tobacco quality. During burning, potassium minerals especially potassium organic salts swell and cause better and more complete oxidation. Potassium is one of the effective factors in better burning of tobacco (Sabeti and Mohammad, 2004). 5 nitrogen sources and 3 application methods were studied in an experiment in Pakistan. Using ammonium nitrate led to relatively better tobacco leaf quality through plant growth with lower nicotine, protein and carbohydrates. The lowest nicotine value and total protein content was obtained in gathered leaves when fertilizer scattered superficially over the fields (khan and Qazi, 1981).

The objective of this study was to investigate the nitrogen and potassium fertilizers effect on yield, quality and some quantitative characteristics of flue-cured tobacco cv.Coker347.

MATERIAL AND METHODS

A two year experiment conducted in 2008-2009 with 35(N1), 45 (N2), 55(N3), 65 (N4) Kg N /ha^{-1} from urea source and 150 (K1), 200 kg K/ha potassium from potassium sulphate source regarding common condition of region and experts advice using a factorial experiment with 8 treatments and 3 replications at Tobacco Research Institute of Rasht city located in Guilan province (Iran) at longitude 49°3′east and latitude 37°16′ north and 25 altitude from sea level. In March of 2007-2008, the nursery of tobacco seedling was prepared and then disinfected using vapan (0.1 lit/m^2) and covered by plastic. After 20 days, the cover was removed and levelling and beating of nursery bed started at the end, fermented animal fertilizer (hourse) was used in 0.5-1 cm thickness and seeds were scattered over 0.1-0.18 m^2 of nursery. From this time until transplanting of seedlings to the main field, all operations like irrigation, covering the nursery at nights, spraying pesticides were carried out.

The field of experiment kept fallow the years before sowing and field providing activities such as fall tillage and rather deep spring tillage vertical to fall tillage were performed and 4 L/ha radical herbicide was used before sowing and mixed with soil through disking. In order to measure the physical and chemical parameters of soil, after providing of main land, a composed soil sample was taken from 0-30 cm depth. After ploughing and primary levelling by hoe, the seedlings were transplanted in 6 lines when they were 20-50 cm high. The space between rows was 110 cm and between plants on rows was 55 cm. The space between plots and replications were 1.5 and 2.5 m respectively. 50% of determined fertilizer level for each plot was applied before sowing and transplanting. Irrigation time was determined using a tensiometer based on suction power of 40-50 cm bar. Weeding control was performed twice.

50% of remained fertilizer level was applied on two bands (The distance between bands was 10 cm) in 10 cm depth of soil. Studied parameters in this article were: leaf yields, stem dry weight, stem height, stem diameter, biomass, plant leaf number, leaf length, leaf width, flowering period, nicotine and sugar content. At industrial ripening, leaves are harvested through 4 picks. The harvested leaves at every picks are first measured after carrying to saloon and the green leaves weight were recorded. Afterwards, the leaves were separately setup at the petiole over the cassettes and transferred to the balkguring hot –house for drying. The leaves passed three steps of giving colour, fixation and drying. The harvested stems were conveyed to the hot-house for three days for drying and then their weight was measured. The plant leaf number was recorded by counting of leaves. Leaf length was measured from initiation of petiole to the tip of leaf by ruler. The widest part of leaf was considered as a leaf width and measured. The number of days from transplanting until reaching 50% of flowering was recorded as flowering time. The auto analyzer set was used for measuring sugar and nicotine content and the measurement method was based on pourin loop or siyanozhen formation. For measurement of reductive sugar percentage, the yellow colour of cyanide ferric was used. The weakening of colour depends on the amount of reductive sugars existed in extract which is measurable in chlorimeter set. Variance analysis and mean comparisons were done by MSTATC and SAS softwares.

Table 1. Average decomposition of variance squares of the studied qualities.

Changes sources (S.O.V)	Dry leaf yield	Stalk height	Stalk diameter	Leaf number	Leaf length	Leaf width	Stalk dry weight	Biomass	Period of flowering	Nicotin	Sugar
Year	1002541.021**	1542.466875**	6.206640833	296.2120333**	89.0802521**	10.60320000	56718.750	15306894.19**	5611.687500**	12.98960208**	522.1987300**
Variety	171897.979**	495.469248*	7.43666458**	34.7596271**	7.8550021	9.64007917**	257687.413*	778473.73**	4.854167	15.933333	5.4206883
Nitrogen	491658.354**	1399.071192**	15.61760833**	64.8018056**	51.7929188**	4.18028056	537313.635**	2005651.91**	83.576389**	0.07617986	7.9253690
Potassium	1020541.688**	1966.592033**	5.76853333*	71.1507000**	122.8480021**	1.09807500	375328.755*	2634375.25**	2.520833	0.61880208*	0.1057502
Nitrogen × variety	377970.465**	337.403683	1.82664444	18.2918278*	17.4099465*	1.16650278	73846.467	742785.58**	5.076389	0.03278542	1.4057662
Potassium × variety	16942.910	14.411192	1.25594167	3.6708056	1.6067521	1.57840556	13502.997	28029.35	8.020833	0.09567431	4.4194546
Potassium × Nitrogen	2015.021	2.236033	0.14520000	1.9360333	0.4820021	0.69120000	38902.547	8590.19	8.020833*	0.333166875	1.2762902
Potassium × Nitrogen × variety	11375.243	37.513239	0.98775556	0.9121611	2.8691678	0.87351667	691.425	7550.80	4.909722	0.00119653	1.5215645

Table 2. Comparison of average effect of year for the studied qualities.

Year	Dry leaf yield	Stalk height	Leaf number	Leaf length	Biomass	Period of flowering	Nicotin	Sugar
First	1468.3b	108.22b	24.42b	44.76a	2454.8b	82.54b	2.38a	10.54b
Second	1757.3a	119.55a	29.39a	42.13b	2812.7a	104.17a	1.34b	17.14a

Table 3. Comparison of average effect of nitrogen for the studied qualities.

Nitrogen	Dry leaf yield	Stalk height	Stalk diameter	Leaf number	Leaf length	Stalk dry weight	Biomass	Period of flowering
35	1374.92c	100.98c	20.15c	24.16c	40.56b	839.0b	2213.9c	89.75c
45	1534.67b	112.76b	20.79bc	26.16bc	44.18/a	888.6b	2423.2c	93.17b
55	1699.17a	127.36a	22.83a	29.66a	45.23a	1309.1a	3151.6a	94.67ab
65	1842.50a	124.45a	21.29b	30.63a	45.81a	1047.0b	2746.3b	95.83a

RESULTS

The effect of year

Variance analysis indicated that the effect of year and others on parameters like dry leaf yield, plant height, leaf number, biomass, flowering period, nicotine and sugar content was significant (P<0.01) (Table 1). Dried leaf yield in the first year (1753.3 Kg/ha) was more than the second year (1468.3 Kg/ha). The plant height in the second year (119.55 cm) was higher than the first year (108.22 cm). The tobacco plants produced more leaves in the second year (29.39 leaves) compared to the first year (24 leaves). The leaf length in the first year (44.86 cm) was longer compared to the second year (42.13 cm). The mean biomass in the first and second year was 2454.8 and 2812.7 Kg/ha respectively. The flowering period in the first and second year was 82.52 and 104.17 days respectively. The greatest nicotine content belonged to the second year with mean of 2.38% compared to 1.34% in the first year. Sugar content in the second year, 17.14%, was greater than the first year, 10.54% (Tables 2 and 3).

The effect of nitrogen

The effect of nitrogen on parameters such as dry leaf yield, stem height, stem diameter, plant number of leaves, leaf length, stem dry weight, biomass, flowering period was significant (P<0.01). The greatest dry leaf yield was associated with applying 65 and 55 Kg N/ha which resulted in

Table 4. Comparison of average effect of potassium for the studied qualities.

Potassium	Dry leaf yield	Stalk height	Stalk diameter	Leaf number	Leaf length	Stalk dry weight	Biomass	Nicotin
150	1467.00b	107.49b	20.92b	25.68b	41.9b	932.49b	2399.5b	1.17a
200	1788.63a	120.29a	21.61a	28.11a	45.1a	1109.34a	2868.0a	1.74b

Table 5. Comparison of average interaction effect of nitrogen and potassium fertilizers for the studied qualities.

Treatment	Dry leaf yield	Leaf number	Leaf length	Biomass
N35K150	1255.8f	22.58d	38.37d	2025.2b
N35K200	1494.0de	25.75c	42.75c	2402.7b
N45K150	1559.8cd	26.33bc	43.69abc	2384.8b
N45K200	1509.5de	25.99c	44.69ab	2461.5b
N55K150	1747.8bc	28.93ab	44.73ab	3037.5a
N55K200	1937.2ab	30.39a	46.13ab	3265.7a
N65K150	1304.5ef	24.91cd	40.80cd	2150.3b
N65K200	2093.8a	2093.8a	46.82a	3342.2a

1842.5 and 1699.17 Kg/ha, respectively. The 45 Kg N/ha level with mean of 1534.67 Kg/ha dried leaf yield was on the next class. The least dry leaf yield (1374.12 Kg/ha) was associated with applying 35 Kg N/ha. The highest stem height belonged to use of 55 and 65 Kg N /ha (with mean of 127.36 and 124.45 cm, respectively). The average height of 122.77 cm was contributed to using 45 Kg N/ha which was ranked in the next class. The minimum height (100.98 cm) belonged to usage of 35 Kg N/ha. Applying 55 kg N/ha led to the highest stem diameter (22.83 mm) and 45 and 65 Kg N/ha levels were in the second and third classes with average thickness of 20.79 and 21.29 mm, respectively. The least stem thickness caused by usage of 35 Kg N/ha with average thickness of 20.15 mm. Levels of 65 and 55 Kg N/ha led to the maximum leaf number with means of 30.63 and 29.66 leaves, respectively. The minimum leaf number (24.16 leaves) was attributed to applying 35 Kg N/ha. The maximum leaf lengths were associated with applying 65, 55 and 45 Kg N/ha (45.81, 45.43 and 44.18 cm, respectively). Likewise using 35 Kg N/ha caused minimum leaf length (40.56 cm). The highest stem dried weight with the average weight of 1309.1 Kg N/ha was associated with usage of 55 Kg N/ha. Adding 65, 45 and 35 Kg N/ha, with the averages of 1047, 8888.6 and 839 kg/ha, respectively, were in the next classes. The greatest amount of biomass with the average of 3151.6 Kg N/ha was associated with applying 55 Kg N/ha. Using 65 Kg N/ha created 2746.6 Kg N/ha which placed in the second class. 45 and 35 Kg N/ha levels placed in the same class of biomass with producing the average weight of 2423.2 and 2213.9 Kg N/ha, respectively. The longest flowering period (95.83 days) was due to use of 65 Kg N/ha. The average flowering length of 94.67 and 93.17 days were related to usage of 55 and 45 Kg N/ha, respectively, and placed in the second and third classes. The shortest flowering period was 89.75 days and related to usage of 35 Kg N/ha.

The effect of Potassium

Potassium had significant effect on dried leaf yield, stem height, plant leaf number, leaf length, biomass ($P<0.01$) and on stem dry weight, nicotine content ($P<0.05$) (Table 2). 200 Kg K/ha level had produced more dry leaf yield (average weight of 1758.63 kg/ha) rather than 150 Kg K/ha level with average weight of 1467 kg/ha. By applying 200 Kg K/ha the tobacco plants had more height (average height of 120.9 cm) rather than 150 Kg K/ha (average height of 107.48 cm). The greatest leaf number (the average leaf number of 28.12 ones) was obtained when 200 Kg K/ha was used. Usage of 150 Kg K/ha led to average leaf number of 25.68 ones. The greatest leaf length (average length of 45.1 cm) was related to usage 200 Kg K/ha. The highest of stem dry weight (1109.34 Kg/ha) was obtained when 200 Kg K/ha was applied. This amount was 932.49 Kg/ha when 150 Kg K/ha was applied. 200 Kg K/ha showed more biomass (2868 Kg/ha) compared to use of 150 Kg K/ha (2399.5 Kg/ha). Applying 150 Kg K/ha led to more nicotine content with average of 1.97% ha rather than usage of 200 Kg K/ha with average of 1.74% (Tables 4 and 5).

The interaction between nitrogen and potassium

The interaction between nitrogen and potassium on parameters like dry leaf yield and biomass was significant (*P<0.01*). Likewise this effect was significant (*P<0.05*) on plant leaf number, leaf length (Table 1). Applying 65 Kg N/ha and 200 Kg K/ha produced the highest amount of dry leaf yield with average weight of 2093.8 Kg/ha. Levels of 55 Kg N/ha plus 200 Kg K/ha with average weight of 1937.2 Kg/ha dry leaf yield, 55 Kg N/ha plus 150 Kg K/ ha with average weight of 1747.80 Kg/ha dry leaf yield and 45 Kg N/ha plus 150 Kg K/ha with average weight of 1559.8 Kg/ha dry leaf yield stand in the second to the fourth class. Levels of 45 Kg N/ha plus 200 Kg K/ha and 35 Kg N/ha plus 200 Kg K/ha with average weight of 1509.5 and 1494 Kg/ha dry leaf yield, respectively, were in the fifth class. Levels of 65 Kg N/ha plus 150 Kg K/ha with average weight of 1304.5 Kg/ha dry leaf yield and 35 Kg N/ha plus 150 Kg K/ha with average weight of 1255.8 Kg/ha dry leaf yield were in the same class and caused the minimum amount of dry leaf yield.

Levels of 55 Kg N/ha plus 200 Kg K/ha as well as 65 Kg N/ha plus 200 Kg K/ha led to the highest leaf numbers with average numbers of 30.39 and 30.36 leaves, respectively. Applying 55 Kg N/ha plus 150 Kg K/ha and 45 Kg N/ha plus 150 Kg K/ha caused average numbers of 28.93 and 26.33 leaves stand in the second and third classes, respectively. Level of 65 Kg N/ ha plus 150 Kg K/ha was in the fifth class for leaf umber (average number of 24.91 leaves). The least leaf number (22.57 leaves) belonged to usage of 35 Kg N/ha plus 150 Kg K/ha. Applying 65 Kg N/ha plus 200 Kg K/ha (46.82 cm), 55 Kg N/ha plus 200 Kg K/ha (46.13 cm) led to the highest leaf length. The levels of 55 Kg N/ha plus 150 Kg K/ha and 45 Kg N/ha plus 200 Kg K/ha which led to average leaf length of 44.70 and 44.86 cm, respectively, were both in the second class. The fertilizer level of 45 Kg N/ha plus 150 Kg K/ha in which the average leaf length of 44.73 cm was appeared, stood in the third class. Likewise, the level of 35 Kg N/ha plus 200 Kg K/ha leaf length of 43.68 cm was in the fourth class. The level of 65 Kg N/ha plus 150 Kg K/ha ranked in the fifth class. The least leaf length (the average length of 38.37 cm) was related to the level of 35 Kg N/ha plus 150 Kg K/ha. The greatest amount of biomass with average weight of 3342.2, 3265.7 and 3037.5 kg/ha were belonged to fertilizer levels of 65 Kg N/ha plus 200 Kg K/ ha, 55 Kg N/ha plus 200 Kg K/ha and 55 Kg N/ha plus 150 Kg K/ha, respectively. the fertilizer levels of 45 Kg N/ha plus 200 Kg K/ha, 35 Kg N/ha plus 200 Kg K/ha, 45 Kg N/ha plus 150 Kg K/ha, 65 Kg N/haplus 150 Kg K/ha and 35 Kg N/ha plus 150 Kg K/ha in which the average biomass amounts included 2661.5, 24.207, 2384.8, 2150.3 and 2025.2 Kg/ha, respectively, were all ranked in the second class.

The interaction between year and potassium

The interaction between year and potassium was significant (*P<0.05*) on flowering period (Table 1). The longest flowering period with the averages of 104.58 and 103.75 days were obtained in the second year by usage of 150 and 200 Kg K/ha, respectively. The second class with average of 83.42 days was related to usage of 200 Kg K/ha. The shortest flowering period (81.67 days) was associated with utilizing 150 Kg K/ha in the first year.

DISCUSSION AND CONCLUSION

All nitrogen requirement of tobacco should be based on plant needs, soil texture, nitrogen residues, Varietal characteristics and lost nitrogen due to washing (Salardini, 2006). Nitrogen had specific importance among micro elements. Tobacco is able to absorb nitrate ions easily and preserve them in leaves. In root cells, nitrate ions are changed into other compounds or transferred inside the xylems and then conveyed towards other organs. Soil temperature and acidity and the type of utilized nitrogen are contributed to the nitrogen absorption by plant. Plant nitrogen depends on nitrogen mobility in soil, and its absorption and transference in plant (Mohsen and Reza, 2000). Nitrogen is a necessary element for composing amino acids, amids, proteins, nucleic acids, nucleotides, coenzymes, hexo amins, etc. (Kafi et al., 2000).

If plants are sown in an area which nitrogen is a restrictive growth element, plants will have lots of developed roots growth but their upper organs don’t grow very well. Conversely the plants which grow in nitrogen-enriched area produce abundant branches and leaves but their roots don’t grow very well. Adding more nitrogen causes less increase than previous time until adding more nitrogen will not have any effect on root weight increase. If more nitrogen is added after this time, the roots will be decayed. As a result, adding the average quantity of nitrogen will have desirable effect on root evolution and using this amount of nitrogen as better than disuse of it (Mohsen, 2000).

Potassium is very important in ionic equilibrium, penetration potential of cellular membrane and glucoside circulation. Potassium deficiency results in necrosis or death of green leaves cells. By gradually reduction of potassium, concentration of malic acid decreases and citric acid amount increases (Sazgar, 1991). In plants with enough leaf potassium content, the energy use efficiency would be 50-70% more than plants with low leaf potassium content. This effect is probably due to potassium role in adenosine triphosphates (ATP) synthesis which is the main compound in conserve and transmission of energy. Potassium has also great impact on osmotic and turgor pressure adjustment via increase of cell size (Sabeti and Mohammad, 2004).

It is obvious that different component reactions which are activated by potassium have positive effect on crop quantity and also on production of materials like sugar, starch, protein, cellulose and vitamins that increase plant quality. In addition, potassium has indirect effect on increase of crop production by increasing of plant resistance to pests and diseases. Increase of pant resistance to pests is due to improvement of cellular wall and also decrease in soluble materials in plants (Hagh, 1991). The plants reactions to potassium absorption mostly depend on nitrogen nutrition level. Generally, the more plant enjoys nitrogen, the more crop yield will be expected due to more potassium.

The needed nitrogen amount for flue-cured tobacco is usually between 40-90 Kg/ha (Adams and Mitchell, 2000). The usage of 20, 30 and 40 Kg N/ha was studied on Tobacco cv.Jayasri in Cathro region, and hrapradesh of India in 1988-1990. Nitrogen concentration was at maximum level in 30 day plants and gradually decreased in harvesting time (after 105 day of growth). Adding more nitrogen from 20 to 40 Kg/ha increased leaf nitrogen content. 30 day plants had the highest amount on protein which gradually reduced after 60 days until harvesting time. The nicotine/total nitrogen ratio reduced during 30 to 90 days after sowing (Murthu et al., 1996). Three field experiments were carried out on flue-cured Tobacco at tobacco research centre of Zagreb in Pitomacha during 1990, 1992, 1993-1996 and 1999-2000 in order to investigate the irrigation effect in different levels of soil water content (40-100, 60-100 and 80-100% PAW), different times of irrigation start point (vegetative, flowering stages and consistently) and combined irrigation with nitrogen nourishment (0, 20, 40 and 60 Kg N/ha). The first two experiments were in a factorial based experiment on randomized complete blocks and the third one was based on split plots. Based on the results, high amounts of nitrogen utilization led to an increase in yield (over 32%) and nicotine content (over 76%) whereas sugar content decreased (over 52%). Likewise the price of 1 Kg fertilized tobacco plunged up to 26% because of using 20 Kg N/ha (Chavlek et al., 2000).

According to the results of an experiment carried out in farmers filed of Rompicherla Mandal, Chitoor and Andhra districts of India in order to investigate the effects of cultivation time, nitrogen level and organic fertilizer on growth and yield of Asian or eastern Tobacco (Oriental), early plantation during the first 14 days of November led to taller plants with greater leaf area, dried matter, green leaf yield and also dried leaf yield. Using 20 Kg N/ha recorded higher value for all mentioned parameters. During the first 14 days of November with using 20 Kg N/ha, green leaf yield and dry leaf yield and nicotine content were increased. In late cultivation time, sugar content was reduced and had negative correlation with fertilizer needs (Sreeramulu et al., 2000). In order to investigate the nitrogen impact on flue- cured tobacco, a two-year experiment conducted in Zagreb tobacco research centre of Pitomaca region, Croatia, with luvisol soil on randomized complete block design with 4 replications. Levels of 0, 20, 30, 40 and 50 Kg N/ha were applied. In each year, average of yield and leaf width and length were increased as nitrogen added from 40 to 50 Kg/ha but the quality and leaf sugar content reduced (Turshich et al., 2003).

The effect of different levels of nitrogen (0, 50, 70 and 90 Kg N/ha) and irrigation on cumulating of leaf nicotine content was studied on tobacco cv. Coker254 and only usage of 90 Kg N/ha caused an increase in leaf nicotine content. Likewise it was revealed that irrigation amount did not affect nicotine content (Aoquza and Zambora, 1987). The effect of topping and nitrogen levels (0, 35 and 70 Kg N/ha) were studied on yield flue-cured tobacco quality in split plot design with 4 replications. Just leaf number among all measured parameters was significant. The greatest harvested leaf number was obtained from topping Coker 254 and fertilized Reams 266. Likewise the topping time affected on nicotine content (nicotine content increase by more topping). Yield and chemical quality was vigorously affected by nitrogen application. More crop yield, harvested leaf number and nicotine content obtained by using 70 Kg N/ha. Local nitrogen fertility of soil, 0.08% total nitrogen and 1.71% organic matter with using 35 Kg N/ha is suitable for flue-cured tobacco for reaching similar yield compared to applying 70 Kg N/ha (Capuno et al., 1998).

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