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Effect of integrated nutrient management on content of *Bt. cotton (Gossipium hirsutum L.)* under north – west agro climatic zone of Gujarat

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Abstract

A field experiment entitled “Integrated Nutrient Management in *Bt. Cotton (Gossipium hirsutum L.)* Under North-West Agro-Climatic Zone of Gujarat” was conducted during *Kharif* season of 2015-16 and 2016-17 at the Polytechnic in Agriculture Farm, Junagadh Agricultural University, Halvad. The Twelve different treatments combinations of organic and inorganic fertilizers (NPK), FYM, *Azotobactor*, PSB and KSB were studied with thrice replication. The concentration of Nitrogen, Phosphorus, potash, Sulphur, Iron, Manganese, Zinc and copper in seed cotton and in stalk was significantly influenced by different treatments of integrated nutrient management. The concentration of different nutrient either in seed cotton or in stalk was not consistent with treatments but overall, the treatment T₉ (100% RDF + FYM 10 t/ha + *Azotobactor* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed) exhibited higher values of nutrient content during both the years as well as in pooled results.

Keywords: *Cotton, INM, Azotobactor, Content,*

Introduction

Cotton is one of the important cash crop next to groundnut in Saurashtra region of Gujarat and plays vital role in the economy of the farmer as well as the country, thus it is popularly known as “White gold”. Cotton, the kind of apparel fibre and to some extent supplementary source of oil, cotton seed oil is also known as heat oil and is good for heart patients since time immemorial has played a vital role in the history and civilization from MohenjoDara and Harppa civilization (3000 B.C.) is full of references, vouching existence of textile industry. During the year of partition and freedom in 1947, India was to content as a very low production of 2.3 million bales of cotton and head to import over 40 percent of its raw cotton demands. Today, the history of Indian cotton is positively written with an all time record production of over 17 million bales, a system relate in production and threefold increase in productivity since independence. In India, cotton occupies an area of 118.72 lakh ha and production 30.15 lakh bales with a yield of 432 kg ha⁻¹ during 2016-17. Primarily Integrated Nutrient Management (INM) reveal to combine old and modern method of nutrient management into ecologically sound and economically optimal farming that uses the benefits from all possible sources of organic, inorganic and biological components/substances in a judicious, efficient and integrated manner (Janssen, 1993) ^[2]. It optimizes all aspects of nutrient cycling including N, P, K and other macro and micro nutrient inputs and outputs, with the aims of synchronizing nutrient demand by the crop and its release in the environment. Integration of organic manures with fertilizers has been traditionally important inputs in crop production for the maintenance of soil fertility and yield stability.

Materials and Methods

The experiment was conducted at Polytechnic in Agriculture Farm, Junagadh Agricultural University, Halvad during both the *kharif* season of 2015-16 and 2016-17. The soils of the field were sandy loam with slight alkaline in reaction. From the fertility point of view, these soils were moderately supplied with organic carbon 6.9 & 6.3 g kg⁻¹, low in available nitrogen 223 & 240 kg ha⁻¹, medium in phosphorus 29 & 28 kg ha⁻¹, potassium 260 & 281 kg ha⁻¹, sulphur 14.32 & 15.68

mg kg⁻¹, medium in Fe 5.48 & 7.32 mg kg⁻¹, Zn 0.68 & 0.58 mg kg⁻¹, and high in Mn 17.86 & 14.22 mg kg⁻¹ and Cu 1.05 & 1.65 mg kg⁻¹ during year 2015 and 2016, respectively. The experiment comprised of twelve treatments viz., T₁-100% RDF i.e. 240:50:150 – N: P: K kg/ ha, T₂-75% RDN + Full PK + *Azotobacter* 10 ml/ kg seed, T₃-75% RDP + Full K + PSB 10 ml/ kg seed, T₄-75% RDK + KSB 10 ml/ kg seed, T₅-75% RDF + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed, T₆-75% RDF + FYM 10 t/ ha, T₇-75%RDF + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed, T₈-100% RDF + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed, T₉-100% RDF + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed, T₁₀-100% RDF + FYM 10 t/ ha, T₁₁-50% RDP + FullNK + FYM 10 t/ ha and T₁₂- N: K₂O as per targeted yield equations (236-0-149 and 210-0-110, N-P-K in 2015 and 2016, respectively), respectively. The nutrients of Nitrogen, Phosphorus and Potash were applied by using different sources of Urea, DAP and MOP. The cotton variety “G.Cot.Hy.8 (BG-II)” was planted in 16-06-2015 and 25-06-2016 during both kharif season with spacing of 120 m × 45 m and seed rate of 4 kg/ ha. The crop was raised with all the standard package of practices and protection measures also timely carried out as they required. The experimental data analyse for yield attributes and yield parameters were statistically analyzed for level of significance.

Results and Discussion

Effect of INM on Nutrient content

The data recorded to the effect of different treatments on content of major (N, P, K and S) and micro (Fe, Mn, Zn and Cu) nutrient in cotton seed and stalk of cotton recorded after harvest are given in Table (1, 2, 3 and 4).

1. Nitrogen content in cotton seed (%)

As result from Table 1 that N content in cotton seed was significantly affected by different treatments. Significantly higher N content (2.02, 2.07 and 2.05%) in seed cotton during both the years and in pooled results were obtained under the treatment T₉ which consist of 100% RDF (240:50:150 kg/ ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed. However, it was found statistically at par with treatments T₇ in 2015 and 2016 year but T₇ and T₁₀ in pooled results. While, significantly lowest N content in cotton seed of cotton crop (1.60, 1.82 and 1.71%) were noticed under the treatment T₄ during both the year as well as in pooled results.

2. Nitrogen content in stalk (%)

The nitrogen content in stalk was significantly influenced by different treatment (Table 1) during both the years as well as in pooled results. Application of 100% RDF (240:50:150 kg/ ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed (T₉) recorded significantly higher nitrogen content in both the years and in pooled results, respectively and it was at par with T₁, T₅, T₆, T₇, T₈, T₁₀ and T₁₁ in both the years as well as at par with treatments T₅, T₆, T₇, T₈, T₁₀ and T₁₁ in pooled results. Lower nitrogen content in cotton stalk was observed under treatment of 75% RDK + KSB 10 ml kg⁻¹ seed (T₄).

3. Phosphorus content in cotton seed (%)

P content in cotton seed (Table 1) was significantly affected by different treatments after harvest. Application of 100% RDF (240:50:150 kg/ ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed (T₉) gave significantly maximum P content (0.555, 0.569 and 0.562%) in

cotton seed of cotton crop during both the years and in pooled results, respectively and it was found on par with treatment T₇ in both the years. Lowest phosphorus content (0.422, 0.423 and 0.423%) were observed in the treatment T₄ i.e. 75% RDK + KSB 10 ml/ kg seed during both the season as well as in pooled results among the all treatments.

4. Phosphorus content in stalk (%)

Under the given treatment (Table 1), P content in stalk was significantly maximum of 0.277, 0.279 and 0.278% during both the years and in pooled results respectively registered with the treatment T₉ i.e 100% RDF (240:50:150) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed, while, the treatment T₄ exhibited significantly lowest P content (0.216, 0.218 and 0.217%) during both the years and in pooled results in stalk of cotton at harvest.

5. Potassium content in cotton seed (%)

The data on potassium content (%) in cotton seed as affected by different treatment are given in Table 2. Application of 100% RDF (240:50:150 kg/ ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed (T₉), resulted significantly the higher potassium content in cotton seed over other treatment during the years of 2015, 2016 and in pooled results in value of 1.054, 1.061 and 1.058%, respectively. Minimum potassium content in cotton seed was obtain under application of (T₄) during both the years and in pooled results.

6. Potassium (K) content in stalk (%)

Results data are given in table (2) resulted that K content in stalk was significantly affected due to all treatments. Significantly higher K content (0.893, 0.897 and 0.895%) in stalk of cotton during both the years as well as in pooled results was registered in the treatment T₉, which was also found statistically at par with treatments T₇ during both the yeas and in pooled results. Significantly lowest K content (0.764, 0.764 and 0.764%) in stalk of cotton were observed in the treatment T₄ during both the years and in pooled results.

7. Sulphur (S) content in cotton seed (%)

From table 2, it could be influenced that S content in seed cotton was significantly affected by different treatments after harvest. Among the various treatments imposed, the treatments T₉ registered significantly higher S content with the value of 0.272, 0.275 and 0.274% during both the year and in pooled results respectively and it was found statistically at par with the treatment T₆, T₇, T₁₀, and T₁₁ in 2015 and 2016 but it was at par with T₇, T₁₀ and T₁₁ in pooled. Whereas, the lowest S content of 0.131, 0.130, and 0.131 per cent were registered under the treatment T₄ during both the years and in pooled results, respectively.

8. Sulphur (S) content in stalk (%)

Different integrated nutrient management treatments exerted their significant effect on S content in stalk (Table 2). Significantly maximum S content (0.198, 0.201 and 0.199%) in stalk of cotton was found in the treatment T₉ comprised of 100% RDF (240:50:150 kg ha⁻¹) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed during both the years and in pooled results. However, it was found statistically at par with treatments T₇ in 2015 and 2016 but in pooled result, it was at par with T₇ and T₁₀. While the treatment T₄ registered significantly minimum S content (0.129, 0.129 and 0.129%) in stalk of cotton crop during 2015, 2016 and also in pooled results.

9. Iron (Fe) content in cotton seed (mg/ kg)

Fe content in seed cotton was significantly resulted due to different treatments according to the data from Table 3. Application of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/ kg seed + KSB 10 ml/ kg seed (T₉) noted significantly higher Fe content (184.55, 183.54 and 184.04 mg/kg) in seed cotton during both the years and in pooled results. However, it was found statistically at par with treatments T₆, T₇ and T₁₀ in 2015 and 2016 as well as T₇ in pooled results, respectively. Significantly lowest Fe content (171.00, 169.60 and 170.30 mg/ kg) in seed cotton was registered with the treatment T₄ during both the years and also in pooled results.

10. Iron (Fe) content in stalk (mg/ kg)

Various fertilization treatments produced significant effect on Fe content in stalk (Table 3) of cotton and significantly the maximum Fe content (141.57, 142.47 and 142.02 mg kg⁻¹) was recorded in the treatment T₉ which constitutes of 100% RDF (240:50:150 kg/ ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml /kg seed + KSB 10 ml/kg seed during both the years as well as pooled results. However, it was found statistically at par with treatments T₆, T₇ and T₁₀ in both the years and T₇ and T₁₀ in pooled results. While, significantly minimum Fe content in stalk of cotton (109.46, 110.88 and 110.17 mg/ kg) were noticed under the treatment T₄ during both the years and in pooled results.

11. Manganese (Mn) content in cotton seed (mg/kg)

Data pertaining to Mn content in seed cotton (Table 3) was significantly affected by different fertilize input treatments. Among the different treatments evaluated, significantly higher Mn content (45.62, 45.31 and 45.47 mg/ kg) was recorded with the treatment T₉ during the both the years as well as pooled results, which was also remained statistically at par with the treatments T₇ and T₁₀ during both the years and also in pooled results. Whereas, significantly lowest Mn content (32.60, 30.32 and 31.46 mg/ kg) were registered with the treatment T₄ during both the years and in pooled results.

12. Manganese (Mn) content in stalk (mg/kg)

Perusal of data on Mn content in stalk in Table 3, inferred that the Mn content in stalk was significantly influenced by the given treatments. Application of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/ kg seed + PSB 10 ml/ kg seed + KSB 10 ml/kg seed (T₉) registered significantly higher Mn content (37.17, 37.85 and 37.51 mg/kg) content in stalk during both the years and in pooled results. However, it was found statistically at par with treatments T₇ and T₁₀ in 2015 and also in pooled results, while T₇ in 2016. The treatment T₄ recorded significantly lowest Mn content (21.92, 19.69 and 20.80 mg/ kg) in stalk of cotton during both the years as well as in pooled results.

13. Zinc (Zn) content in seed cotton (mg/kg)

Zn content in seed cotton (Table 4) was significantly affected due to different treatments. Significantly the maximum Zn content (46.33, 46.38 and 46.3 mg/kg) in seed cotton of cotton was recorded with the treatment T₉ during both the years as well as in pooled results and it was found statistically at par with the treatment T₇ and T₁₀ in 2015 and in pooled results, whereas T₆, T₇ and T₁₀ in 2016. Significantly lowest Zn content in seed cotton (31.41, 33.04 and 32.23 mg/kg) of cotton were observed in the treatment T₄ during both the years and also in pooled data.

14. Zinc (Zn) content in stalk (mg/kg)

With regard to observation of Zn content in stalk (Table 4) was

significantly influenced due to various treatments. Under the given treatment schedule, the treatment T₉ which was comprised of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed registered higher Zn content (39.86, 40.75 and 40.30 mg/kg) in stalk during both the years and in pooled results, respectively. However, it was found statistically at par with the treatments T₇ in 2015, 2016 and also in pooled data. Whereas, the lowest Zn content (21.50, 22.42 and 21.96 mg/kg) in stalk of cotton was noticed under the treatment T₄ in 2015, 2016 and in pooled data, respectively.

15. Copper (Cu) content in seed cotton (mg/kg)

Copper content in seed cotton was significantly affected due to various treatments according to the data from Table 4. Application of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed (T₉) recorded significantly higher Cu content (16.28, 16.92 and 16.60 mg/kg) in seed cotton in 2015, 2016 and also in pooled data, respectively. Significantly lowest Cu content (10.77, 10.36 and 10.57 mg/kg) in seed cotton were registered with the treatment T₄ during both the years and also in pooled results, respectively.

16. Copper (Cu) content in stalk (mg kg⁻¹)

Different fertilization treatments produced significant effect on Cu content in stalk (Table 4) of cotton and significantly the maximum Cu content (13.42, 13.42 and 13.42 mg/kg) was recorded with the treatment T₉ which consist of 100% RDF (240:50:150 kg/ha) + FYM 10 t ha⁻¹ + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed during both the years as well as pooled results. Significantly minimum Cu content in stalk of cotton (9.11, 9.12 and 9.11 mg/kg) were noticed under the treatment T₄ in 2015, 2016 and in pooled data, respectively.

Increase in content of N, P, K, S, Fe, Mn, Zn, and Cu in seed cotton and stalk (Table 1, 2, 3 and 4) were significantly higher with application of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed (T₉) but it was at par with the application of 75% RDF + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed (T₇) in respect of almost all nutrient under study which might be due to favorable and synergistic effect on availability of nutrient caused by the application of different nutrient sources (organic and inorganic). The improvement in content of cotton seed and stalk may be ascribed to greater availability of nutrients in soil and their increased absorption by roots, their transportation towards foliage (source) and later on re-translocation to the seed cotton and stalk by various metabolic activities and more availability in soil nutrients by fixing atmospheric nitrogen and dissolution of fixed, unavailable phosphorus and reserve potassium in soil.

Higher photosynthetic activity in plants as evident from increase in biomass accumulation at successive duration and plant height reveals higher availability of metabolites from shoot to root. This might have promoted growth of root as well as their functional activity resulting in higher extraction of nutrients from soil environment to aerial parts. The application of treatments through integration of organic and inorganic sources resulted nutrient balance and their availability in soil which may favored the nutrient off take by crop. The content of nutrient is also affected due to application of respective elements. These results are in close conformity with the findings of those reported by Vadaria (2011), Yaseen *et al.* (1999) ^[5] and Singh and Ahlawat (2012) ^[3]. The concentration of major (N, P, K, and S) and micro (Fe, Mn,

Zn and Cu) nutrients in seed cotton and stalk was significantly altered by different INM treatments and their higher values were recorded with treatment T₉ i.e. 100% RDF + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg

seed followed by treatment T₇ i.e. 75% RDF + FYM 10 t/ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed than remaining other treatments of this study.

Table 1: Effect of integrated nutrient management on nitrogen and phosphorus content in seed cotton and stalk of *Bt.* Cotton at harvest

Treatments	N content in seed cotton (%)			N content in stalk (%)			P content in seed cotton (%)			P content in stalk (%)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
T ₁	1.90	1.93	1.91	0.886	0.903	0.895	0.476	0.480	0.478	0.227	0.230	0.228
T ₂	1.86	1.92	1.89	0.873	0.861	0.867	0.430	0.432	0.431	0.219	0.221	0.220
T ₃	1.76	1.85	1.80	0.816	0.765	0.791	0.464	0.464	0.464	0.225	0.227	0.226
T ₄	1.60	1.82	1.71	0.741	0.741	0.741	0.422	0.423	0.423	0.216	0.218	0.217
T ₅	1.92	1.94	1.93	0.905	0.916	0.911	0.485	0.488	0.487	0.228	0.231	0.230
T ₆	1.94	1.96	1.95	0.929	0.929	0.929	0.511	0.521	0.516	0.241	0.245	0.243
T ₇	1.98	2.01	1.99	0.934	0.934	0.934	0.534	0.545	0.539	0.261	0.266	0.264
T ₈	1.93	1.95	1.94	0.919	0.921	0.920	0.498	0.499	0.499	0.233	0.236	0.235
T ₉	2.02	2.07	2.05	0.935	0.936	0.935	0.555	0.569	0.562	0.277	0.279	0.278
T ₁₀	1.95	1.96	1.96	0.933	0.931	0.932	0.525	0.534	0.530	0.257	0.261	0.259
T ₁₁	1.94	1.95	1.94	0.925	0.926	0.926	0.505	0.514	0.510	0.239	0.242	0.241
T ₁₂	1.84	1.88	1.86	0.866	0.844	0.855	0.436	0.437	0.436	0.217	0.219	0.218
S.Em.±	0.02	0.02	0.03	0.019	0.018	0.013	0.009	0.009	0.006	0.004	0.003	0.003
C.D. at 5%	0.05	0.07	0.09	0.054	0.051	0.036	0.027	0.025	0.018	0.013	0.010	0.008
C.V.%	1.42	2.10	1.80	3.61	3.44	3.53	3.28	3.04	3.16	3.210	2.440	2.840

Table 2: Effect of integrated nutrient management on potassium and sulphur content in seed cotton and stalk of *Bt.* cotton at harvest

Treatments	K content in seed cotton (%)			K content in stalk (%)			S content in seed cotton (%)			S content in stalk (%)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
T ₁	0.909	0.892	0.901	0.793	0.804	0.799	0.149	0.164	0.157	0.148	0.164	0.156
T ₂	0.883	0.875	0.879	0.790	0.798	0.794	0.140	0.145	0.142	0.141	0.144	0.143
T ₃	0.873	0.851	0.862	0.789	0.788	0.788	0.138	0.133	0.136	0.134	0.132	0.133
T ₄	0.853	0.784	0.819	0.764	0.764	0.764	0.131	0.130	0.131	0.129	0.129	0.129
T ₅	0.846	0.717	0.781	0.807	0.845	0.826	0.154	0.169	0.161	0.158	0.173	0.165
T ₆	0.933	0.972	0.952	0.837	0.860	0.849	0.260	0.266	0.263	0.182	0.189	0.185
T ₇	1.008	1.009	1.009	0.887	0.882	0.885	0.270	0.272	0.271	0.194	0.195	0.195
T ₈	0.943	0.971	0.957	0.821	0.847	0.834	0.155	0.178	0.166	0.168	0.183	0.176
T ₉	1.054	1.061	1.058	0.893	0.897	0.895	0.272	0.275	0.274	0.198	0.201	0.199
T ₁₀	0.972	0.984	0.978	0.843	0.866	0.855	0.268	0.271	0.269	0.193	0.194	0.193
T ₁₁	0.966	0.981	0.974	0.840	0.848	0.844	0.263	0.269	0.266	0.186	0.191	0.188
T ₁₂	0.870	0.832	0.851	0.770	0.784	0.777	0.148	0.157	0.153	0.142	0.156	0.149
S.Em.±	0.010	0.009	0.023	0.013	0.008	0.008	0.004	0.005	0.003	0.001	0.003	0.003
C.D. at 5%	0.030	0.026	0.072	0.038	0.024	0.022	0.012	0.014	0.009	0.004	0.008	0.010
C.V.%	1.92	1.65	1.79	2.77	1.73	2.30	3.72	3.90	3.81	1.50	2.60	2.14

Table 3: Effect of integrated nutrient management on Fe and Mn content in seed cotton and stalk of *Bt.* cotton at harvest

Treatments	Fe content in seed cotton (mg kg ⁻¹)			Fe content in stalk (mg kg ⁻¹)			Mn content in seed cotton (mg kg ⁻¹)			Mn content in stalk (mg kg ⁻¹)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
T ₁	176.85	175.35	176.10	121.98	125.89	123.94	38.68	38.19	38.44	28.71	24.19	26.45
T ₂	173.54	172.56	173.05	115.24	115.87	115.55	35.08	34.25	34.66	24.51	22.29	23.40
T ₃	171.38	170.43	170.91	113.62	112.73	113.17	33.33	32.60	32.97	22.85	20.67	21.76
T ₄	171.00	169.60	170.30	109.46	110.88	110.17	32.60	30.32	31.46	21.92	19.69	20.80
T ₅	178.20	176.78	177.49	125.17	134.78	129.98	39.56	39.21	39.39	30.38	25.65	28.01
T ₆	181.68	180.21	180.95	137.50	138.30	137.90	42.22	42.28	42.25	34.39	34.42	34.41
T ₇	183.29	182.26	182.77	139.80	141.90	140.85	44.00	44.92	44.46	36.52	36.56	36.54
T ₈	178.61	177.65	178.13	130.82	134.90	132.86	40.39	41.93	41.16	32.11	29.85	30.98
T ₉	184.55	183.54	184.04	141.57	142.47	142.02	45.62	45.31	45.47	37.17	37.85	37.51
T ₁₀	181.13	180.52	180.83	138.02	139.39	138.71	43.98	43.78	43.88	35.56	35.73	35.64
T ₁₁	178.97	178.66	178.82	132.91	136.43	134.67	42.30	42.22	42.26	33.02	32.70	32.86
T ₁₂	174.37	174.17	174.27	118.51	119.48	119.00	37.43	37.32	37.37	26.37	23.80	25.08
S.Em.±	1.40	1.20	0.92	1.36	1.89	1.16	0.88	1.03	0.68	0.77	0.70	0.91
C.D. at 5%	4.10	3.51	2.62	3.99	5.53	3.31	2.59	3.01	1.93	2.25	2.04	2.82
C.V.%	1.36	1.17	1.27	1.85	2.52	2.22	3.86	4.52	4.2	4.39	4.21	4.31

Table 4: Effect of integrated nutrient management on Zn and Cu content in seed cotton and stalk of *Bt* cotton at harvest

Treatments	Zn content in seed cotton (mg kg ⁻¹)			Zn content in stalk (mg kg ⁻¹)			Cu content in seed cotton (mg kg ⁻¹)			Cu content in stalk (mg kg ⁻¹)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
T ₁	37.69	39.15	38.42	28.08	29.49	28.79	12.62	12.25	12.43	9.80	10.05	9.93
T ₂	34.77	35.57	35.17	23.03	26.55	24.79	11.58	11.35	11.47	9.33	9.54	9.44
T ₃	33.95	34.70	34.33	22.21	24.26	23.23	11.24	11.00	11.12	9.19	9.25	9.22
T ₄	31.41	33.04	32.23	21.50	22.42	21.96	10.77	10.36	10.57	9.11	9.12	9.11
T ₅	38.37	40.72	39.54	30.04	33.15	31.60	12.98	12.44	12.71	10.10	10.38	10.24
T ₆	40.41	43.23	41.82	36.38	36.24	36.31	14.20	14.36	14.28	10.29	10.88	10.59
T ₇	45.52	45.10	45.31	38.17	39.59	38.88	15.47	15.47	15.47	11.61	11.98	11.80
T ₈	39.32	42.19	40.75	30.32	34.55	32.43	13.33	14.08	13.70	10.45	10.52	10.48
T ₉	46.33	46.38	46.36	39.86	40.75	40.30	16.28	16.92	16.60	13.42	13.42	13.42
T ₁₀	43.74	44.59	44.17	37.04	38.12	37.58	14.82	14.42	14.62	11.46	11.47	11.46
T ₁₁	42.73	42.93	42.83	34.66	35.04	34.85	13.61	14.18	13.90	10.92	10.78	10.85
T ₁₂	35.23	37.62	36.43	26.81	27.48	27.14	11.98	12.11	12.04	9.50	9.82	9.66
S.Em.±	1.07	1.14	0.78	0.88	0.89	0.63	0.19	0.38	0.21	0.28	0.23	0.18
C.D. at 5%	3.14	3.33	2.23	2.59	2.60	1.78	0.56	1.12	0.61	0.82	0.68	0.52
C.V.%	4.74	4.86	4.81	4.99	4.75	4.87	2.51	4.99	3.95	4.66	3.81	4.25

Conclusion

On the basis of two years experimentation, the application of 100% RDF (240:50:150 kg/ha) + FYM 10 t/ ha + *Azotobacter* 10 ml/kg seed + PSB 10 ml/kg seed + KSB 10 ml/kg seed (T₉) exhibited its superiority in respect of content of of nutrients by seed cotton and stalk in sandy loam soil under North-West Agro-climatic Zone of Gujarat.

Overall, the application of organic (FYM), inorganic (NPK) fertilizer and bio fertilizers (*Azotobacter*, PSB and KSB) in integration plays an offensive role in improving content of nutrient.

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