Research Paper Agricultural Science

Integration Of Different Herbicides Influenced by Fiber Quality of Cotton (Gossypium Hirsutum L.)

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ABSTRACT

Based on effect of different weed management practices on fiber quality traits of cotton field tested during kharif 2013-14 & 2014-15. Integration of herbicides differed significantly with respect to fiber length and oil yield traits but ginning turn out, fiber fineness, fiber strength and oil content did not show significant effect. Except Weed free, oxyfluorfen 0.180 kg ha^{-1} PE *fb* IC & HW at 30 & 60 DAS showed maximum fiber length, fiber strength, fiber fineness, oil content and oil yield while integration of different herbicides showed maximum ginning turn out against minimum values for other quality traits.

KEYWORDS Herbicides, Fiber quality, Cotton

INTRODUCTION

Cotton fiber quality is defined by the physical properties that relate to its spin ability into yarn and contribute to textile performance and quality. The most important of these properties are those associated with the length, strength and fineness (micronaire) of the fiber. One of the most important aspects of cotton fiber quality is fiber or staple length. Fiber length is the normal length of a typical portion of the fibers of a cotton sample. Longer fibers can be processed at greater efficiencies and produce finer and stronger yarns by allowing fibers to twist around each other more times, while shorter fiber require increased twisting during spinning, causing low-strength and poor-quality yarns. Fiber fineness is another important component of fiber quality because of its direct impact on processing performance and the quality of end product. Fiber strength is important because the inherent breaking strength of individual cotton fiber is considered to be the most important factor in determining the strength of the yarn spun from those fibers. The present research work was conducted to analyze the fiber quality parameters of some cotton genotypes for the selection of superior genotypes for further breeding programme. (*Koli et al.,*2014). Keeping in view the above contradictory, a study was planned to see the integration of different herbicides application rates on quality determining traits of diverse cotton.

MATERIALS AND METHODS

A field experiment was carried out to determine the integration of different herbicides on fiber quality traits of cotton at Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during Kharif 2013-14 & 2014-15. The trial was arranged in a randomized complete block design and replicated thrice.

Seedbed was prepared by cultivating the field two times with tractor mounted cultivar each followed by planking. The crop was sown on medium black calcareous soil. Sowing was done on well prepared seed beds with the help of single row hand drill. Each plot consisted of five rows (5 m long) with 0.45 m distance between rows. Thinning was done at four leaf stage. Experimental ten treatments comprised of cotton crop viz. Pendimethalin 0.900 kg ha^{-1} PE *fb* IC & HW at 30 & 60 DAS (T_1), Oxyfluorfen 0.180 kg ha^{-1} PE *fb* IC & HW at 30 & 60 DAS (T_2), Oxadiargyl 0.090 kg ha^{-1} PE *fb* IC & HW at 30 & 60 DAS (T_3), IC & HW at 15-20 DAS *fb* quizalofop-ethyl 0.040 kg ha^{-1} POE at 45 DAS (T_4), IC & HW at 15-20 DAS *fb* imazethapyr 0.075 kg ha^{-1} POE at 45 DAS (T_5), IC & HW at 15-20 DAS *fb*propaquizafop 0.050 kg ha^{-1} POE at 45 DAS (T_6), IC & HW at 15-20, 45 DAS *fb* glyphosate 0.96 kg ha^{-1} POE at 75 DAS (directed spray) (T_7), IC & HW at 30 & 60 DAS *fb* herbigation of pendimethalin 0.900 kg ha^{-1} at 60 DAS (with irrigation water) (T_8), Weed free (T_9) and Unweeded check (T_{10}). A dose of 240 kg N, 50 kg P_2O_5 and 150 kg K_2O ha^{-1} were applied in the form of urea and dia ammonium phosphate, respectively. Whole of NPK was applied at sowing and nitrogen was applied in three equal splits viz. at sowing, after 30 days and 60 days of sowing. Overall five irrigations were applied and weeds were controlled by as per treatments. Insecticides were applied to control the sucking insects (Aphid, Jassid, Whitefly, Thrips and Mites) and bollworms (American bollworm, Pink bollworm and Spotted bollworm). All other agronomic practices were kept normal and uniform for all the treatments. When seedlings were well established, ten guarded representative plants were selected randomly in each plot and marked for identification. These plants were monitored and tagged to record data. Ginning out turn (%) was calculated after roller ginning approximately 200 g samples of the harvested seed cotton and GOT (%) was computed by using the following formula:

GOT (%) = (Weight of lint / Weight of seed cotton) x 100

After ginning, 100 g lint samples were used for determination of various quality parameters. Lint quality parameters were determined in high volume instruments (HVI): (a) fiber strength as force (g tex^{-1}) necessary to break the fiber bundle, (b) fiber fineness; expressed in standard micronaire units, (c) fiber length; expressed in mm (d) oil content; expressed in percentage and (e) oil yield; expressed in kg ha^{-1}. All fiber tests were carried out at the laboratories of Main Cotton Research Station, Navsari Agricultural University, Navsari.

Statistical analysis: Data collected on different parameters were analyzed statistically by using MSTATC program (Anonymous, 1986) for analysis of variance and means were compared using Fisher's protected least significance difference (LSD) test at 5 % probability level (Steel et al., 1997).

RESULTS AND DISCUSSION

Herbicides is the factor influencing fiber quality while agronomic practices are of secondary importance in cotton crop (Bednarz *et al.*, 2005). Application of herbicides improve ginning out turn while application of herbicides did show non-significant effect on quality of cotton fiber (Makhdum et al., 2000). Weed free condition under the above mentioned treatments provided favorable condition to root and cotton seed development due to efficient control of weeds which also increased nutrient uptake of soil which might help to increase quality parameters and oil content in cotton seed. Balasubramanian and Sankaran, (2001). The presented study indicated that fiber quality characters mainly remained unaffected (P>0.05) by herbicides application rates while differed with respect to most of quality traits.

Ginning out turn (%): Data pertaining to ginning out turn did not showed significant effect on integration of different herbicides (Table 1). Statistically maximum GOT (35.70 %) was recorded in weed free, followed by oxyfluorfen 0.180 kg ha^{-1} PE fb IC and HW at 30 & 60 DAS (35.16 %) and Pendimethalin 0.900 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS (34.97 %). Our findings are similar to Ahuja et al. (2007). Mohammad (2001) reported that ginning turn out was affected by herbicide application had significant effect on lint yield and lint.

Fiber strength (g tex^{-1}): Fiber strength is an important trait in determining yarn spinability, because weak fiber (low strength) are difficult to handle during manufacturing process (Saleem et al., 2010). Table 1 shows that two years (Y) affected significantly while integration of herbicides treatments (T) and interaction, Y x T were found to be non-significant in this respect. Maximum fiber strength (19.0 g tex^{-1}) was observed in weed free and minimum was recorded in unweeded control (18.0 g tex^{-1}) (Table 2). Faircloth (2007) reported that fiber strength varies among cultivars. Linear correlation coefficient for ginning out turn (%) vs. fiber strength (g tex^{-1}) was 0.299 (Fig-1[a]) that shows that fiber strength increased with increase in ginning out turn.

Fiber fineness (micronaire): The comparison of different treatments means indicated that no significant effect on fiber fineness while herbicides application and two years x integration of herbicides treatments was non-significant (Table 1). Statistically maximum thickness of fiber (minimum fineness) was recorded in case of weed free (4.23 micronaire) while minimum fiber thickness (maximum fineness) was found in unweeded control (3.88 micronaire). Copur (2006) and Ehsan et al. (2008) concluded that cultivars differed with respect to fiber fineness. The was a positive correlation (0.923) between fiber fines and GOT indicating that fiber fineness will be more improve with more GOT.

Fiber length (mm): Data regarding fiber length (mm) revealed that cultivars had significant while herbicides application and interaction (years x herbicides) were found to have significant effect on fiber length as shown in Table 1. Significantly comparison of treatments means (Table 2) showed that weed free and oxyfluorfen 0.180 kg ha^{-1} PE fb IC and HW at 30 & 60 DAS had statistically more fiber length (24.68 mm and 24.47 mm, respectively) at par with pendimethalin 0.900 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS (24.33 mm) and IC & HW at 15-20 DAS fb quizalofop-ethyl 0.040 kg ha^{-1} POE at 45 DAS (24.16 mm). Our results are similar with the findings of Bednarz et al., (2005) who reported that fiber uniformity is a genetically controlled character and can be improved by selection. Relationship between GOT and fiber length was good (r = 0.95), however trend line indicates that for GOT will make it good for fiber length (Fig-1[c]).

Oil content (%) and yield (kg ha^{-1}): Analysis of variance (Table 1) shows that herbicides interaction had non-significant effect on oil content (%). Statistically higher oil content and oil yield (18.97 % and 535 kg/ha, respectively) was recorded in weed free followed by oxyfluorfen 0.180 kg ha^{-1} PE fb IC and HW at 30 & 60 DAS (18.72 % and 519 kg/ha, respectively) and pendimethalin 0.900 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS (18.62 % and 492 kg/ha, respectively) as shown in Table 2. Our results are similar with the finding of Asif et al. (2008) who reported that application of different herbicides did not show any effect on fiber quality traits of cotton. Linear correlation coefficient (r) value for ginning out turn vs. oil content and yield was 0.97 & 0.94 (Fig-1[d & e]) which indicates that the relationship was good.

CONCLUSION

Amongst the tested integrated herbicides, except weed free, oxyfluorfen 0.180 kg ha^{-1} PE fb IC and HW at 30 & 60 DAS showed higher fiber strength, fiber fineness, fiber length, oil content and yield. Ginning out turn of a variety is positively correlated with most fiber quality parameters determining traits however; it showed no improvement with increasing herbicides application rate.

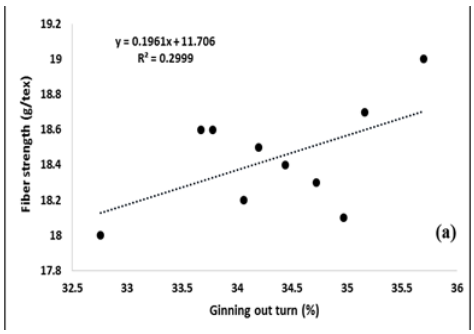
Table 1. Mean square values from analysis of variance of fiber quality traits of cotton.

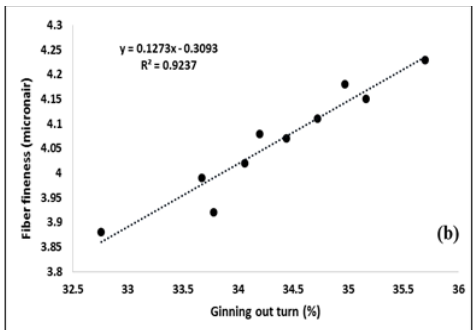
Source of variance	d.f.	Ginning %	Fiber length (mm)	Fiber fitness (micronair	Fiber strength (g/tex)	Oil content (%)	Oil yield (kg/ha)
Pooled two years data (2013-14 & 2014-15)							
R / Y	4	10.25	4.01**	0.49**	1.65	2.87	10310**
Y	1	236**	6.81**	1.36**	7.59*	7.59*	146443**
Treatment	9	4.28	3.01**	0.07	0.51	0.51	48327
Y x T	9	0.45	0.05	0.00	0.02	0.02	963
Error	36	4.81	0.76	0.11	1.49	1.35	4854

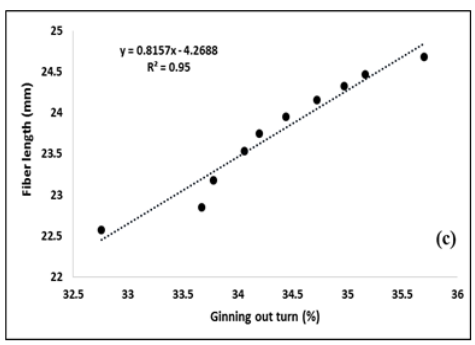
Table 2. Effect of different integration of herbicides treatments on fiber quality parameters of cotton (Pooled).

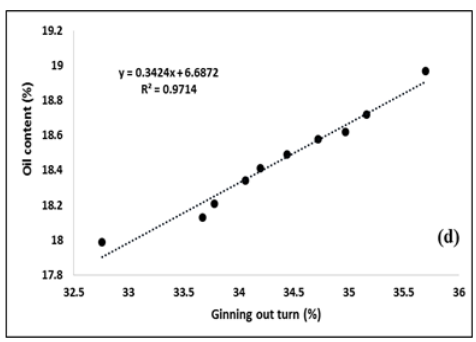
Treatments	Ginning percentage	Fibre length (mm)	Fibre fineness (Micronaire value)	Fibre strength (g tex^{-1})	Oil content (%)	Oil yield (kg ha^{-1})
Pendimethalin 0.900 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS	34.97	24.33	4.18	18.1	18.62	492
Oxyfluorfen 0.180 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS	35.16	24.47	4.15	18.7	18.72	519
Oxadiargyl 0.090 kg ha^{-1} PE fb IC & HW at 30 & 60 DAS	34.06	23.53	4.02	18.2	18.34	360
IC & HW at 15-20 DAS fb quizalofop-ethyl 0.040 kg ha^{-1} POE at 45 DAS	34.72	24.16	4.11	18.3	18.58	450
IC & HW at 15-20 DAS fb imazethapyr 0.075 kg ha^{-1} POE at 45 DAS	33.67	22.85	3.99	18.6	18.13	315
IC & HW at 15-20 DAS fb propaquizafop 0.050 kg ha^{-1} POE at 45 DAS	33.78	23.18	3.92	18.6	18.21	333
IC & HW at 15-20, 45 DAS fb glyphosate 0.96 kg ha^{-1} POE at 75 DAS (directed spray)	34.44	23.95	4.07	18.4	18.49	411

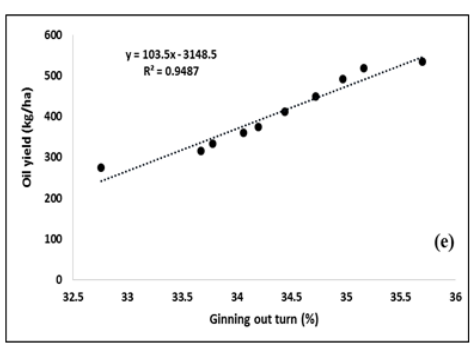
IC & HW at 30 & 60 DAS fb herbigation of pendimethalin 0.900 kg ha^{-1} at 60 DAS (with irrigation water)	34.20	23.75	4.08	18.5	18.41	375
Weed free	35.70	24.68	4.23	19.0	18.97	535
Unweeded control	32.76	22.57	3.88	18.0	17.99	275
LSD (p=0.05)	NS	1.02	NS	NS	NS	81.58











Quality parameters of cotton	Linear regression equation	R^2
Fiber length	Y = 0.8157x - 4.2688	0.95
Fiber fineness	Y= 0.1273x – 0.3093	0.92
Fiber strength	Y = 0.1961x + 11.706	0.29
Oil content	Y = 0.3424x + 6.6872	0.97
Oil yield	Y = 103.5x – 3148.5	0.94

REFERANCES

1. Ahuja, S.L., L.S. Dhayal, and R. Prakash, (2007). Comparative yield component analysis in Gossypium hirsutum parents using fiber quality grouping. Euphytica, 161(3): 391 399.
2. Anon. (2014a). All India Area, Production and Productivity of cotton in India. Cotton Advisory Board. The Cotton Corporation of India Ltd. http://www.cotcorp.gov.in.
3. Anon. (2014b). District wise Area, Production and Productivity of cotton in Gujarat State. Cotton Advisory Board. The Cotton Corporation of India Ltd. http://www.cotcorp.gov.in.
4. Anon. (1986). MSTATC. Microcomputer Statistical Programme. Michigan State University, Michigan, Lansing, USA.
5. Asif, M., J.I. Mirza, and Y. Zafar, (2008). Genetic analysis for fiber quality traits of some cotton genotypes. Pak J. Bot., 40(3): 1209 1215.
6. Balasubramanian, K. and S. Sankaran, (2001). Influence of herbicides and tillage on the quality characters of cotton. Indian Agriculturist, 45(3/4): 253-260.
7. Bednarz, C. W., W.D. Shurley, W.S. Anthony, and R. L. Nichols, (2005). Yield, quality, and profitability of cotton produced at varying plant densities. Agron. J., 97: 235–240.
8. Copur, O. (2006). Determination of yield and yield components of some cotton cultivars in semi-arid conditions. Pakistan J. Biol. Sci., 9(14): 2572-2578.
9. Ehsan, F., A. Ali, M. A. Nadeem, M. Tahir, and A. Majeed, (2008). Comparative Yield Performance of New Cultivars of Cotton (Gossypium hirsutum L.). Pakistan J. Life and Social Sci., 6(1): 1-3.
10. Faircloth, J. C. (2007). Cotton variety trials. Virginia cotton production guide. Virginia Polytechnic Inst. and State Univ. Coop. Ext. Publ.424-300. Virginia Polytechnic Institution of State University, Blacksburg. pp. 8-15.
11. Koli, G.P., D. V. Patil, and A.B. Bagade, (2014). Comparative study for fiber quality parameters in cotton (Gossypium sp. L.). Int. J. Curr. Microbiol. App. Sci., 3(11) 628-632.
12. Makhdum, M. I., M. N. A. Malik, F. I. Chaudhry and Shabab-ud-din (2000). "Response of cotton to balanced fertilization in soils of variable texture", The Pakistan Cottons, 44: 49-55.
13. Mohammad, J. B. (2001). Stability and adaptability analysis of some quantitative traits in upland cotton varieties. Pakistan J. Sci. & Ind. Res. 44(2): 105-108.
14. Saleem, M. F., M. F. Bilal, M. Awais, M. Q. Shahid and S. A. Anjum (2010). Effect of nitrogen on seed cotton yield and fiber qualities of cotton (Gossypium hirsutum L.) cultivars. J. Anim. & Plant Sci., 20 (1):23-27.
15. Steel, R. G. D., J.H. Torrie, and D. A. Dickey, (1997). Principles and procedures of statistics: A biometrical approach. 3rd ed. McGraw Hill Book Co. Inc. New York; 400-428.