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Determining Stickiness in Cotton using Contest-S Instrument

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Abstract
Stickiness is a serious global problem. Stickiness contaminated cotton can impede ginning, spinning and all subsequences textile processes. Contest-S is a thermo-detector method determining stickiness, mainly for raw cotton and for sliver if needed. In this study; 18 cotton samples were originated from different textile factories. All cotton samples classified using Contest-S for stickiness grade into very low, low, moderate, high and extremely very high spinning risk probability stickiness for all studied samples. Sample of E/018 had the highest stickiness grade and showed very high spinning risk probability (283.67). Meanwhile both of Egyptian cotton Giza 95 and Giza 98 had not risk probability, hence stickiness grade mean results were 16 and 24, respectively compared to the other rest 16 cotton samples which varied from no, low, medium, high and very high spinning risk probability. In general; well-implemented integrated for both of pest insecticides and all agricultural practical plant management plans are the main defenses against stickiness problem.

Keywords: Cotton, Stickiness, Contest-S, Spinning Risk Probability

Introduction

Cotton is the most widely used of all plant fibers which is woven into soft, strong, absorbent fabrics to make clothing, bed sheets, carpeting, tablecloths, and other items. Other parts of plant provide raw materials for a wide variety of useful products (Ebaido and Mona Shalaby 2019) [15].

Stickiness in cotton is anything in the lint that can adhere to cotton processing equipments and it can be originated from several different sources, including handing or mechanical adulterants (such as oils, seed glue, crushed seeds, etc.) or plant sugars (physiological sugars), and insect honeydew sugars (entomological sugar). Where entomological sugars are more common than physiological sugars, is a very serious problem for textile industry. The presence of machinery lubricants or high levels of certain types of plant trash may also cause sticking of lint in fiber processing. (Hector and Hodkinson 1989) [21].

Contamination by aphid and white fly is called honeydew. The result of infestation of growing cotton by aphids or whiteflies; presence of randomly distributed droplets of highly concentrated sugars causing stickiness. Increasing the level of monosaccharide on cotton fiber such as fructose and glucose, microbial activity may alter the sugar level in both of quantitative and qualitative and consume sugar. All details of biotic and abiotic stickiness reasons were illustrated by Cheung *et al*. (1980) [10], Bruno (1984) [9], Heuer and Plaut (1985) [29], Atalie *et al*. (2022) [4]. Besides, immature fibers have a higher content of sucrose, which tends to be stickier than other vegetal sugars.

Cotton is grown in six continents and more than seventy countries, so there is a huge variety of atmospheric environmental surrounded cotton plant which are the connecting link between cotton plant and all unfavorable pests and diseases such as stickiness (Hequet *et al*., 2007). Cotton stickiness is a worldwide problem, both for the perspective of fiber processing and for the perspective of cotton production (Hector and Hodkinson 1989, Henry and Perkins 1993, Gourlot and Frydrych 2001 and Strolz 2001) [21, 23, 18, 39].

The term “stickiness” has a technical definition when it occurs in textile machinery: “the tendency of cotton fibers to adhere or stick to textile working surfaces” (European Committee for Standardization 2001) [16].

The stickiness of cotton causes health hazard to the workers. Moreover, the cotton honeydew stickiness affects the economy of the textile industry and society as a whole, as stated by Hadwich (1968) [20], Talpay (1968) [40], Gutknecht (1988) [19], Debra and

Hodkinson (1997) [14], Adamu and Wagaye (2020) [1]. Stickiness affects both productivity and quality parameters. For cotton growers, cotton ginners, and spinners, it affects the processing efficiency as well as the quality of the product (Perkins 1983 [34], Hequet and Abidi 2002 [24], Hequet *et al*. 2007, Bancroft *et al*. 2006 [5], Amara *et al*. 2007 [3], Henneberry *et al*. 2007 [22] and Behera *et al*. 2022 [7]).

To growers, stickiness means higher costs for insect control and reduced cotton marketability in terms of mechanical harvest with stripper or spindle pickers then it will naturally sell at a discount depending upon the level of stickiness. For ginner, stickiness may mean special handling and processing requirements in so much that clogging ginning machines and financial losses due to frequent replacement of blades/saws and combers. For spinner at the textile mill, stickiness means reduced processing efficiency, lower yarn quality and increased maintenance of machinery may occur even with slightly sticky cotton. All stickiness problems from farm to manufacture were stated by Hadwich (1968) [20], Robert *et al*. (1976) [36], Bourely (1980) [8], Cheung *et al.* (1980) [10], Price (1988) [35], Hequet and Frydrych (1992) [26], Afzal (2001) [2], Ghule *et al.* (2004) [17] and Tesema (2022) [41].

The two main causes of sugars or honeydew becoming sticky are heat and moisture. The friction forces of fibers with some mechanical parts elevate the temperature at yarn formation machines. If one or more of the sugars melt; stickiness results. Obviously moisture will cause sugars to change from a crystalline state (non sticky) to an amorphous state (sticky).

According to the presence of stickiness, clean up is expensive and time consuming by using specific spray or particular treatment application to remediate the sticky condition. Therefore, the most efficient way to control or mitigate the symptoms of stickiness by using pesticides for controlling aphids and white fly and avoiding conditions leading to outbreaks by farming and harvesting cotton yield at the recommended time for each region farm. Stickiness may be managed by blending sticky cottons with nonstick cottons at acceptable range and lowering the percentage of humidity during carding and card crush rolls using refrigerator. There were different remedies treatments were used by Gutknecht (1988) [19] and Jamil *et al*. (2007) [30].

Then it is required to obtain a reasonable detective of stickiness. Globally; the international round test for stickiness of the International Cotton Committee on Testing Method- International Textile Manufacturers Federation (ICCTM-ITMF) has recognized several techniques with the aim of harmonizing the results of different stickiness testers. Several different methods are detecting and measuring stickiness go with the direction of the type of sugar such as chemical methods as; simple method, reducing sugar method and complex, high performance liquid chromatography. Others go with the level of stickiness such as mechanical method as minicard, fiber contamination tester which is designed to provide high speed measurement of cotton stickiness besides measurements for trash, neps, and seed coat fragments. Hence thermo-mechanical method such as high speed stickiness detector and sticky cotton thermo-detector such as contest-s; all details of all previous methods were elaborated by Perkins (1971) [33], Perkins (1983) [34], Knowlton (1998) [31], Barton *et al*. (2005) [6], Jamil *et al*. (2007) [30], and Chun (2008) [13].

Therefore; many valuable research works have been conducted to instrumentally characterize the level of stickiness found on commercial cottons. Hence, stickiness test methods, solely thermo-mechanical methods could suitable for trading purpose. Thermo-detector methods have been accepted as the international standard for lint stickiness measurements. These points were elaborated by (Hequet *et al*. 1997 [27], Henneberry, 2007 [22] and Hequet *et al*., 2007).

In terms of Contest-S manual; it is important to understand that the scale given in this presentation is only meant as an indicator of the degree of stickiness to give the opportunity to do all available practices to be able to manage the cotton to be processed, thus reducing the risk of stickiness issue.

The aim of current study is to evaluate contest-s measurements of sticky cottons.

Materials and Methods

This study was performed at Egyptian & International Cotton Classification Center (EICCC), Cotton Research Institute (CRI), Agricultural Research Center (ARC) using Contest-S instrument at 2024. Materials used in this work were different originated cotton samples from different textile factories in Egypt which were chosen as wide variation in stickiness; consists of Sudan 1, Sudan 2, Sudan 3, Sudan 4, standard instrument sample (SIS), Greek, Brazil, B. Faso, USA, Koudistex 1, Koudistex 2, Gaidtex 1, Gaidtex 2, C/018, D/018, E/018, Giza 95 (G 95) and Giza 98 (G 98). All previous materials were taken in terms of the integration relations between both of research with industrial sectors.

Properties of stickiness are listed as follow:

1. Total stickiness count /g
2. Stickiness point classification by size, in 5 classes (1= small, 5 big sticky points).
3. Average size of stickiness points.
4. Stickiness grade.

All target studied samples were performed at standard conditions in order to get reproducible test results, according to ISO 139 (20±2^{0}C temperature and 65%±4% Relative Humidity) with non-condensing using Unflair^{TM} (2023) [42] equipment (Air Technology System).

Contest-S is a semi-fully automatic high speed thermo-detector designed to measure and classify the sticky points in cotton for large mass testing in compliance with the international standard UNI EN 14278-3. Contest-S; that manufactory by the Italian company Mesdan has received an official and full recognition by the ITMF-ICCTM in April 2020 concerning the usefulness and benefits of using the stickiness tester grade in spinning, trading and research purposes. Contest-S provides the fastest testing method for stickiness in the world. There were a single reference method is identified due to the large variability of results between different instruments and different laboratories such as stickiness round tests.

Contest-s is high volume testing equipment designed to detect, measure, classify and grade cotton stickiness (honeydew/sugar) in cotton fiber material as shown in Image 1.

Image 1: Contest-S instrument for stickiness tester (MESDAN 2020) [32]

The measurements take place automatically, therefore test results is independent from operator influence due to highly automated operation. The sample preparation is easy and the operation of the user interface is intuitive and simple.

Image 2 showed a sample preparation by a cylinder shape; the operator feeds the conveyer belt by a 3.5g sample which is processed into 30±3 cm.

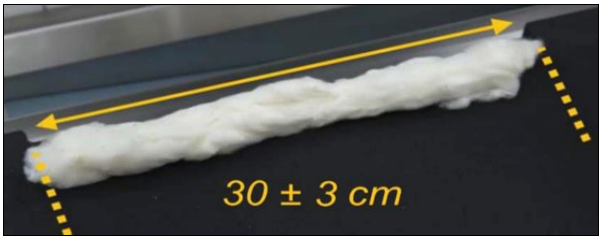

Image 2: Preparing a sample for Contest-S (MESDAN 2020) [32]

Then is delivered to the stickiness tester and pressed in between two metal heated drums revolving in opposite direction and constantly heated at 35±1Cº (after a warming up period). While no sticky fibers (the residual webs) are sucked away, the sticky deposits adhering to the drum surface are optically inspected by a laser beam, as well as counted and divided into 5 scales which are related to the number of fiber attached to the sticky point. Stickiness can be detected from zero level (non-sticky cotton) up to high level (sticky cotton). Sticky points are measured and classified by amount and size. The sticky particles are adhering to the drum surface are optically inspected. The whole process is automatically achieved in about 30 seconds. All details of instrument parts and procedures were detected by Contest-S (2020a and b) [11, 12] and Mesdan (2020) [32].

Performing thermo-mechanical measurement according to the sticky points weighted to their sizes. Grading of the sample stickiness depending on amount and size of sticky points. The count classes 1-5 are related to the number of fibers attached to the sticky point. Depending on the decrease of the laser signal; the sticky point is classified in class 1 if the number of fibers are few (approximately less than 3 fibers), up to class 5 if the number of fibers is quite large (approximately greater than 30-40 fibers) as shown by image (3).

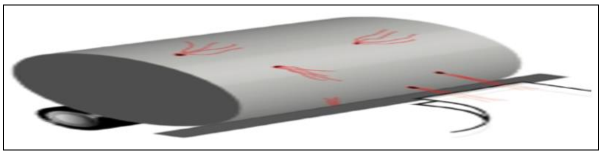

Image 3: Clusters of sticky points (MESDAN 2020) [32]

During the test, the surface of the drums are automatically cleaned by a system of rotating brushes, as well as a blade mechanism, which prevents double counting and/or contamination between subsequent measurements. At the end of each test, a check of the stability of the laser signals ensures the proper cleaning of the drum surfaces and warns the user in case of need.

The Stickiness Grade parameter is calculated by means of the formula:

$$\text{Stickiness grade}= \sum_{i=1}\sum_{i=1}^{5}(i * Si)$$

Where S_i is the number of sticky points of class i.

Stickiness grade is a sum of count weighted on the five classes. Where stickiness grade combines together two different information about stickiness; count and their indirect size evaluation. In such a way to represent the probability that a decrease of efficiency may occur in spinning due to the stickiness.

Image 4 elaborated both of Stickiness grade and spinning risk probability with degree of color from green to red which is indicated by no risk to extremely high, respectively as shown by interface results. So, the spinning risk probability could screened by stickiness grade and converted units; Image 5. The Spinning Risk Probability should be considered as a starting advice in order to reduce the risk of stickiness below the critical threshold of spinning line, thus enabling spinner to decide how to process and blend different cotton bales. Contest-S module requires daily, weekly and monthly cleaning according to specific instructions of the manufacturer so that the correct functioning and the high level of performance are maintained in time.

STICKINESS GRADE	SPINNING RISK PROBABILITY
0-50	No Risk
51-100	Low
101-160	Medium
161-250	High
251-500	Very High
>501	Extremely High

Image 4: Final results of stickiness grade with spinning risk probability (MESDAN 2020) [32]

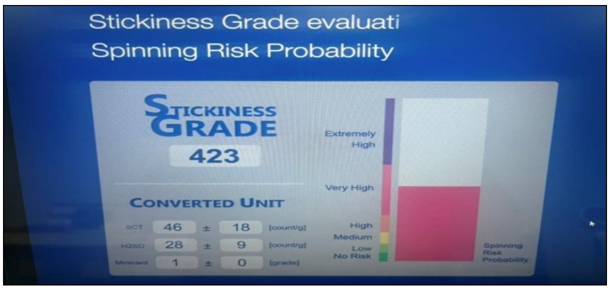

Image 5: Stickiness grade with converted units for SCT, H2SD and Minicard (MESDAN 2020) [32]

Descriptive statistics analyses were calculated and elucidated according to Steel and Torrie (1980) [38]. SPSS (2012) [37] software was used for all statistical analyses.

Results

Stickiness descriptive parameters were elaborated for stickiness criteria by simple statistics parameters; including measures of tendency such as mean, measures of dispersion such as minimum, maximum and coefficient of variation (C.V).

Table 1 exhibited the classes of the sticky points for the studied cotton samples. It was assured that total classes count property for E/018 gave the highest mean value in terms of classes' values with 27, 20, 24.33, 11.33 and 19.33 for class 1, 2, 3, 4 and 5, respectively compared with the other 17 cotton samples. All values of these counts property depends on all descriptive values of the five classes which had different stickiness points in each class with fluctuation in values without an obvious trend of differences.

Table 2 illustrated that E/018 had the highest mean value for stickiness grade and total classes count properties with 283.67 and 116.67, respectively.

Table 2 revealed that there was no association between the grade of stickiness and size. Then USA cotton sample had the lowest value of size inspite of its grade was higher than standard instrument sample (SIS), Greek, Brazil, Koudistex 1,2 and Giza 95 cottons had higher value of size.

It is worthy to mention that the coefficient of variation (C.V.) exhibited the lowest variation in size compared with grade and total classes count for all cotton samples. Both of class 1 and 3 for Brazil, class 1 for B. Faso and class 2 for USA cottons gave the same values of mean, minimum and maximum and no values for C.V. according to the totally conformity between stickiness points values. It is due to all the elements of the previous samples are equal. Elements of these samples are no different from the mean then the standard deviation of them equals zero (0). In so much that C.V. gave zero (0).

The sticky points for low value are mostly varying from very tiny to moderate sticky. In the contrary high sticky points are vary from high to very high and finally extremely high. The lower value indicate a lower level of stickiness which is proper for all industrial processes and the higher value indicate a higher level of stickiness which is hazard for almost industrial processes and it depends on the final product to the range of ability to apply expensive methods or not to get over the stickiness problem.

Table 1: Descriptive statistics for the five classes of the sticky points

Group1	Statistic	Class 1	Class 2	Class 3	Class 4	Class 5
Sudan 1	**Min**	12	12	8	5	5
	Max	16	17	16	12	11
	Mean	14.83	14	13.83	8.67	8.33
	C.V.	10.81	14.35	22.12	29.82	31.99
Sudan 2	**Min**	11	9	7	2	4
	Max	19	16	15	9	13
	Mean	15.00	12.33	11.67	6.67	8.33
	C.V.	19.33	19.67	26.44	30.77	33.40
Sudan 3	**Min**	8	8	8	3	2
	Max	15	15	20	10	9
	Mean	11.5	11.17	12.50	6.33	4.83
	C.V.	27.91	27.39	30.96	33.97	32.66
Sudan 4	**Min**	5	3	3	2	1
	Max	9	8	7	5	6
	Mean	6.67	5.67	5.17	3.50	3.50
	C.V.	24.40	24.30	30.91	30.44	13.41
SIS	**Min**	1	1	0	0	1
	Max	4	4	4	1	2
	Mean	2.33	2.17	1.67	0.67	1.17
	C.V.	14.22	16.34	27.00	12.01	11.91
Greek	**Min**	1	1	1	0	0
	Max	3	2	2	1	1
	Mean	2	1.33	1.33	0.67	0.33
	C.V.	14.00	12.21	25.21	11.31	12.50
Brazil	**Min**	1	0	1	1	0
	Max	1	1	1	1	1
	Mean	1	0.67	1	1	0.33
	C.V.	0	19.45	0	0	17.50
B. Faso	**Min**	2	1	1	1	0
	Max	2	3	3	2	1
	Mean	2	1.67	2	1.33	0.67
	C.V.	0	17.56	18.96	20.89	16.12
USA	**Min**	1	1	0	0	0
	Max	3	1	3	1	2
	Mean	2	1	1	0.33	0.67
	C.V.	9.00	0	17.00	15.00	19.00
Koudistex 1	**Min**	0	1	2	1	0
	Max	4	2	3	6	1
	Mean	1.67	1.67	2.33	2.40	0.67
	C.V.	12.33	14.60	20.80	11.31	12.11

Koudistex 2	**Min**	2	1	1	0	0
	Max	3	2	2	1	1
	Mean	2.67	1.33	1.33	0.67	0.67
	C.V.	21.60	14.40	12.40	16.10	16.11
Gaidtex 1	**Min**	2	3	2	2	0
	Max	10	9	11	6	6
	Mean	6.1	6.3	5.9	3.2	2
	C.V.	11.04	19.50	16.99	18.41	12.10
Gaidtex 2	**Min**	0	0	1	0	0
	Max	4	6	6	3	3
	Mean	2.2	2.50	2.4	1.3	1.2
	C.V.	15.80	18.41	16.50	11.20	10.56

Continue Table 1:

Group1	Statistic	Class 1	Class 2	Class 3	Class 4	Class 5
C/018	**Min**	15	12	13	5	4
	Max	16	13	14	8	5
	Mean	15.33	12.67	13.67	6.67	4.33
	C.V.	13.76	14.55	14.17	20.91	13.33
D/018	**Min**	20	16	16	8	5
	Max	21	22	24	9	7
	Mean	20.67	18.33	21.33	7.23	6.00
	C.V.	12.79	17.54	21.65	17.98	16.67
E/018	**Min**	24	15	22	9	15
	Max	32	29	29	15	27
	Mean	27	20	24.33	11.33	19.33
	C.V.	26.14	39.05	16.49	28.38	34.44
G 95	**Min**	1	1	1	0	0
	Max	4	3	2	1	1
	Mean	2.50	2	1.17	0.67	0.69
	C.V.	4.96	4.70	3.87	7.01	4.78
G 98	**Min**	3	2	2	0	0
	Max	24	15	12	5	2
	Mean	8.67	2.67	4.67	1.83	1.33
	C.V.	4.18	8.70	8.88	4.09	2.67

Table 2: Descriptive statistics for stickiness grade, size and total classes count of all samples

Group 1	Statistic	Grade	Size	Total classes Count
Sudan 1	**Min**	110	2.4	46
	Max	194	2.9	67
	Mean	160	2.67	59.67
	C.V.	19.40	7.40	12.91
Sudan 2	**Min**	83	2.4	34
	Max	170	2.9	63
	Mean	143	2.63	54
	C.V.	22.30	7.90	19.85
Sudan 3	**Min**	70	2.4	29
	Max	190	2.8	69
	Mean	120.83	2.60	46.33
	C.V.	33.42	6.48	30.50
Sudan 4	**Min**	33	2.4	14
	Max	93	2.8	33
	Mean	65	2.62	24.50
	C.V.	35.40	30.56	31.80
SIS	**Min**	9	2.2	3
	Max	27	3.0	12
	Mean	19.17	2.62	7.5
	C.V.	33.20	2.90	33.40
Greek	**Min**	6	2	3
	Max	30	2.5	8
	Mean	18.67	2.23	2.67
	C.V.	32.50	11.30	30.20

Continue Table 2:

Group 1	Statistic	Grade	Size	Total classes Count
Brazil	**Min**	8	2.5	3
	Max	15	3	5
	Mean	21	2.73	4
	C.V.	32.80	4.00	25.05
B. Faso	**Min**	16	2.6	6
	Max	26	2.7	10
	Mean	23	2.63	7.67
	C.V.	26.50	2.99	27.20
USA	**Min**	3	1.5	2
	Max	24	2	9
	Mean	21.67	1.73	5
	C.V.	33.51	14.66	30.30
Koudistex 1	**Min**	13	2.1	5
	Max	19	2.6	9
	Mean	15.33	2.40	6.33
	C.V.	21.00	11.52	30.29
Koudistex 2	**Min**	12	2.1	5
	Max	17	2.4	8
	Mean	19.33	2.30	6.67
	C.V.	18.90	7.15	22.90
Gaidtex 1	**Min**	24	2.3	10
	Max	100	2.7	39
	Mean	59.20	2.51	23.50
	C.V.	31.50	6.52	29.68
Gaidtex 2	**Min**	8	2.0	3
	Max	48	3.1	18
	Mean	28.60	2.64	9.60
	C.V.	34.26	12.90	10.41
C/018	**Min**	124	2.3	52
	Max	132	2.5	53
	Mean	128	2.4	53.67
	C.V.	26.59	4.17	19.20
D/018	**Min**	174	2.4	73
	Max	192	2.5	76
	Mean	184.67	2.47	74.67
	C.V.	36.58	11.35	22.05
E/018	**Min**	239	2.6	88
	Max	372	2.8	132
	Mean	283.67	2.70	116.67
	C.V.	36.52	13.70	21.29
G 95	**Min**	6	2	3
	Max	22	2.7	10
	Mean	16	2.60	7
	C.V.	7.63	1.68	11.98
G98	**Min**	15	1.9	8
	Max	30	2.7	58
	Mean	24	2.20	22.17
	C.V.	7.56	2.01	14.69

Ranking the spinning risk probability for cotton samples according to the values of stickiness grades is shown in Table 3. According to stickiness category Table 3 and Image 4 illustrated that; all stickiness grade divided into 6 grades; they vary from no risk for spinning risk probability followed by low, medium, high, very high then finally extremely high spinning risk probability. The highest stickiness value (>501) give extremely stickiness risk meanwhile (0-50) give no stickiness risk.

Hence Table 1 showed cotton stickiness grade divided into; (0-50) by no spinning risk probability for samples of Standard Instrument Sample (SIS), Greek, Brazil, B. Faso, USA, Koudistex 1, Koudistex 2, Gaidtex2, D/018, Giza 95 and Giza 98. (51-100) by low stickiness spinning probability for Sudan 4, Gaidtex1. (101-160) with medium stickiness spinning probability for Sudan 1, Sudan 2,

Table 3: Stickiness grade and spinning risk probability for cotton samples

Sample	Stickiness grade	Rank of Spinning risk probability	Sample	Stickiness grade	Rank of Spinning risk probability
Sudan 1	160	Medium	**Koudistex 1**	15	No risk
Sudan 2	143	Medium	**Koudistex 2**	19	No risk
Sudan 3	121	Medium	**Gaidtex 1**	59	Low risk
Sudan 4	65	Low risk	**Gaidtex 2**	29	No risk
SIS	19	No risk	**C/018**	128	Medium
Greek	19	No risk	**D/018**	37	No risk
Brazil	21	No risk	**E/018**	284	Very high
B. Faso	23	No risk	**G 95**	16	No risk
USA	34	No risk	**G 98**	24	No risk

Sudan 3 and C/018. (161-250) by high stickiness spinning risk probability. Finally; (251-500) by very high stickiness spinning risk probability for E/018 with grade stickiness mean equaled 283.67. Both of total sticky points count of the five classes with sticky point size each one give grade of each sample by mathematical equations.

Figure 1 illustrated the mean values of stickiness grade of 18 studied cotton samples. Only E/018 cotton sample showed very high spinning risk probability, whereas C/018 and Sudanese cottons exhibited medium spinning risk probability of stickiness. On the other hand, Egyptian and remain cotton samples did not show spinning risk probability where displayed the less value of stickiness grade. Egyptian Giza 95 and Giza 98 which were occupy no spinning risk probability category of stickiness compared to the highest stickiness grade mean value for E/018 which exhibited very high spinning risk probability of stickiness. These results assured Egyptian cotton was virtually free from stickiness.

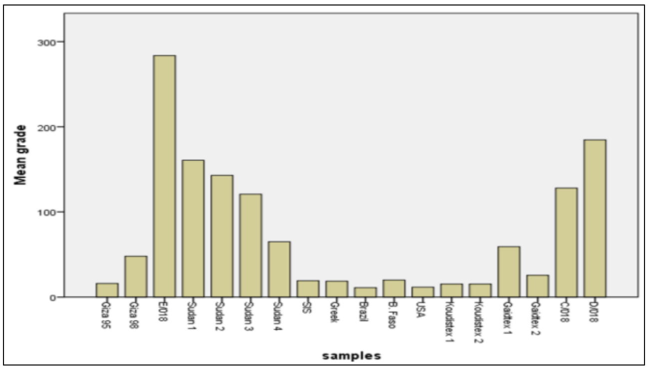

Fig 1: Relationship between stickiness grade with all studied cotton samples

From both of Tables 1, 2 and 3 and Figure 1 it could be summarized that the lower value indicated a lower level of stickiness which is proper for all industrial processes and the higher value indicated a higher level of stickiness which is hazard for almost industrial processes but it depends on the possessing that industrial mill may apply different methods to overcome this problem or not?

Based on the classification of the tested sample, Contest-S can build the stickiness contamination profile for all different cotton origin samples process in industries production. Besides, it should be emphasized that this type of analysis refers only to the specific samples analyzed, and the results obtained do not concern the origin of cotton in general. Plotting the average values of stickiness grade appreciated mathematic equation of how the grade measurements could be very low, low, medium, high, very high or extremely high stickiness. In addition to stickiness grade versus stickiness count differing from sample to other. According to all bales for gins or mills should be evaluated for each bale by routine testing. Contest-S provides details on the characteristics that are significant for sticky cotton and use for all internationally imported and exported sticky cotton. These lists of stickiness characteristics for each target material serve as a source of information for plant growers, plant production, commercial advisors and industrial stakeholders.

Conclusion

Honeydew cotton stickiness is a global problem which affects health hazards, marketability, the ginning processes and spinning mills. In addition to mitigate the stickiness presence by changing metal parts of devices or adding particular matters. All studies on stickiness tend to either the type of sugars or the intensive detection of stickiness. There are several different methodology instruments to simplify the degree of stickiness. One of them is; Contest-s is an instrument for mass testing of stickiness. All sticky points are detected and measured whatever is the source of stickiness such as no risk, low, medium, high, very high and extremely high for spinning risk management. Contest-S is rapid, accurate and reliable for all stickiness measurements. Contest-S has the ability to detect and measure all kinds of stickiness contamination that could somehow create a stickiness problem in the spinning process to get reliable measurements for the target product quality through the spinning risk probability. It is a must to apply all agricultural implemented practical in integration way to impede the presence of reasons of pest and stickiness problem. Hence; it is crucial to cotton classer to use Contest-S instrument to evaluate the stickiness of cotton bales to verify the no risk of spinning probability.

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