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Release of New Cotton Variety "IUB 222"

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ABSTRACT

A new cotton variety IUB 222 possessing strong tolerance to cotton leaf curl disease accompanied by superior yield, fiber quality and drought tolerance is developed by Department of Plant Breeding and Genetics, UCA and ES, The Islamia University of Bahawalpur, Pakistan. It is under the varietal approval process however, has been recommended by the Expert Sub Committee held on 16-4-2013 for general cultivation. It was developed through crossing of diversified parents utilizing gene pyramiding technique for the incorporation of CLCuD tolerance with combinations of excellent fiber traits, drought tolerance and higher yield potential.F_1 population resulting from the parental crossways advanced by using modified pedigree method with selection beginning in the F_2 generation. The superior combinations were finally selected from F_5 generation based on yield potential, fiber quality and overall better performance over standard varieties. Breeding line, No. 69185 superior in yield along with other important traits was entered into the statewide Cotton Variety Testing Program. The advanced breeding lines were evaluated in randomized preliminary yield trials and promoted to performance tests. In varietal trials(NCVT and PCCT) conducted for two growing seasons (2011-12 and 2012-13),IUB 222 out yielded significantly all the standard varieties; CIM 598, MNH886 and AA802. IUB 222 is high yielding widely adapted Punjab, desirable resistance to CLCuD and excellent fiber quality that fulfills the need of the competitive high lint yield as well as meets industrial requirements. The new line was recommended to be released as improved new cottonvariety "IUB 222".

KEY WORDS: *Gossypium hirsutum* L., Cotton variety IUB222, drought tolerant, CLCuD tolerant

INTRODUCTION

Cotton is an important cash crop and lifeline of textile industry. During recent years many agricultural varieties are developed. New varieties are originated from crosses involving older varieties races or species. The cultivated new world allotetraploid cotton species dominates world cotton production. *Gossypium barbadense* is known for extra long fine and strong fiber. Cultivated *Gossypium hirsutum*, upland cotton accounts for major world production. Breeding cotton remained a continuous objective for the development of new varieties and sustainable seed cotton yield. Large numbers of cotton varieties were generally released for farmer's cultivation in Pakistan such as NIAB78, CIM496, S12, MNH493, Krishma, Tarzan, IR-NIBGE-3, NIAB-Bt-1, MNH886 and FH142 are famous in cotton community.

Hence, Cotton is an important fiber crop of the world that plays a significant role in reduction of unemployment pressure, stabilizing the national and international development and is a big source of raw material for textile industry (Ahmed*et al*., 2009). A comprehensive research work conducted by cotton scientists revealed that regulation of plant physiology, growth and development activities plays a key role in attaining optimum plant height, maximum fruit producing buds and boll weight of cotton that contributed ultimately in the enhancement of per unit area cotton yield (Ali and Hameed, 2011). It was revealed by Calhoun *et al.* (1997) and Bowman *et al*. (2006) that most comprehensive sources of pedigree information are prevailed for successful breeding program. These findings identify pedigrees of cultivars established between 1970 and 2005 and also give some pedigree information on early foundation lines as far back as the 18th century. The origin of most of the cultivars was found to be used in the mid–20th century and is also a valuable resource (Ware, 1950).

Both biotic and abiotic stresses significantly reduce the growth and productivity of cotton. During last 20 yearsCotton leaf curl disease is a most important threat to cotton crop that causes enormous losses in cotton productivity particularly in Pakistan. It appeared in epidemic form that reduced the national yield upto 9.05 m bales during 1992-93 and 8.04 million bales durin1993-94. The uncertainty of inheritance of CLCuD depends upon the evolution of new variants of virus due to the evolutionary potential of pathogen as a result of recombination. Long lasting resistancecan never be retained by reason of viralalteration and be deficient of durable resistance in

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germplasm. During 2002, CLCuD resistance was broken down due to new species called Cotton leaf curl Burewala virus and all resistant cotton varieties were infected with this new species. Cotton scientists initiated efforts for identifying sources of resistance to Burewala disease (BVD) and few genotypes; NIBGE-115 during 2002-2006 and NN-3 developed by NIBGE are tolerant to BYD (Rahman and Zafar,2012)

Amongst the abiotic stresses reducing crop productivity, shortage of irrigation water is a primary limiting factor in many regions of the world (Sinclair, 2005). As a result of increasing demand and competition from environmental, industrial and domestic sectors, supply of fresh water to agriculture sector is likely to be reduced in the coming years. Thus keeping in view the current situation of water supply in rivers and canals, it has become indispensable to bread drought tolerant varieties of various crops through selection and breeding.

Thus breeding for resistance is a continuous process for the development of new cotton varieties through different ways like conventional breeding methods and molecular techniques that help in controlling this disease (Farooq *et al*, 2011).Main objectives for the development of cotton variety is, high yield and early maturity, resistant to disease and pests, long staple length, fiber strength , fineness of fiber and increased lint to seed ratio. Hence, the release of new high yielding, resistant to CLCuD variety with good quality traits would boost up the sustainable cotton productivity in the country.

The breeder role is generally critical up to now concerned with cotton crop. In cotton development of new varieties is extremely composite and conscientious as comparatively simple in other crops .due to diversity of objectives behind a new variety development complication will occur. It is expected that new improved variety designate as high long and strong fibred, fine and homogeneous linted, high yielding with high ginning out-turn, resistant to a range of pests and diseases, modified to an extensive range of agro-ecological conditions and socioeconomic farming systems, approachable to higher dozes of fertilizer and moisture. If it contain all of features given above, then it should be suitable for pure seed production, which means that it should possess clarity, standardization and constancy norms.

It is common inspection that the varieties, almost immediately after release start losing identity, showing deterioration and low production potential. The usual causes behind this include mechanical factors like mixing during farm operations, genetically factors like crosspollination, gene frequency changes, natural gene mutation and a disease epidemics. There is fundamental need to develop a variety with passage of time which performs well in all type of disease epidemic conditions.

Materials and Methods

Elite germplasm was exploited and selected to make various crosses for development of present cultivar. For developing genetic resistance in cotton genotypes, available germplasm was utilized during routine breeding program. Development of IUB222 involved a cross between two hybrids developed by crossing in following fashion i.e., (85022 (IUB-09) × CIM473) and (MNH786× MNH-6070)during spring season 2007-08at department of Plant Breeding and Genetics UCA&ES, The Islamia University Bahawalpur Pakistan. Among parents CIM-473 is CLCuD tolerant, late maturing, bushy type, medium boll weight having expectable fiber traits with good mike. Another important component of parentage is MNH-786, which is Non-Bt, broad leafed, erect type, early maturing, good boll weight, CLCuD tolerant, expectable fiber traits and having mike towards higher side. IUB-O9 (85022) is Bt, early maturing, medium leaf size, CLCuD tolerant, good boll weight, excellent fiber length, strength and heat tolerant having Cry1AC gene. MNH-6070 is highly tolerant to CLCuD with medium boll size, yellow pollen, medium leaf size, high GOT but fiber length and fineness are not at acceptable level.

During next season (2008-09) 100 plants of F_1were raised in the field and negative selection was performed at maturity discarding undesirable plants. The selected F_1 were picked and bulked to grow 1000 plants of F_2generation in tunnel during 2009. The spaced planting was accomplished in order to select single plant from segregation population using modified pedigree method. At maturity, desirable single plants were marked among whole population and picked separately and advanced to succeeding generation. Single plant progeny was grown in F_3 generation during 2009-10, in the field and desirable single plants were identified from each single plant progeny and picked and promoted for next generation. During, 2010 single plants were grown in tunnel to raise F_4 generation and repeated same selection process to promote for next generation.

Group of superior plants selected from each single plant progeny were picked and bulked. F_5generation was grown in the field to multiply the seed during season 2010-11. The current line, IUB 222 was of the selected progeny from F_5 generation and was subjected for testing in CVT, PCCT, ZVT,PYT,AYT, PSC, NCBT, NCVT, 1.25 acre Bt. Cotton trial and agronomic studies during 2011 to 2013. Uniform and recommended agronomic practices were applied during selection and testing procedures. Each yield trial was organized in a replicated design using standard check varieties. Data on morphological and quality traits were recorded and statistically analyzed using for MS Stat-C software program for the comparison with standards checks.

Results and Discussion: Newly developed line IUB222 was recommended for general cultivation in Punjab for high yield production. It has medium to tall plant, produces 0-3 monopodial branches per plant, medium to long sympodial branches, took48 days to first flower and 90 days to first boll opening. In addition to these traits, this new cultivar has Boll weight of 3.7gram and growth pattern of semi erract/semi bushy. Possess fair heat tolerance, very good tolerance to drought and CLCuD. Regarding fiber quality, IUB 222 possess a highly acceptable staple length of 29.53mm, having mike 4.92 ug/inch, fiber strength101.05g/tex and GOT 40.86 %. This cultivar carries Cry 1 Ac (*Bt*) gene for bollworm resistance. Seed cotton yield production in PSC's 1.5 Acre trial was 34.09mond/Ac., NCVT yield of 2682Kg/hac. Crop stand was very good having vigorous growth as a result of least infection of pest as recorded for 2 years studies (Table-1).

Results of yield trials are presented in tables 2 to 10. Yield performance as shown in table-2 of PYT and AYT conducted during 2011-12 1nd 2012-13 that IUB 222 gave significantly higher yield than N-121 and MNH886. New line was tested in NCBT during 2011-12 as mention in table-3. It ranked 2nd in term of seed cotton yield on Punjab average (2884 kg/hac.) with percentage increase of 2093 and 31.62 over check varieties AA802 and IR-3701 yielded 2384 kg/ha and 2191Kg/hac respectively. While, during 2012-13 NCBT performance shown in table - 4, IUB 222 produced higher yield in all locations of Punjab with average yield of 2682 kg/ha which is 38.10% higher than check variety, CIM 598 with yield of 1942kg/ha. It remained 3rd position on the Pakistan basis.

Provincial coordinated cotton trials were conducted during 2011-12 at 6 locations of Punjab as mention in table-5. Higher seed cotton yield (3056 Kg/ha) was obtained from IUB 222 with increase of 26.8% and 3.80% over check varieties, IR3701 (2410kg/ha) and MNH 886(2944kg/hac) respectively. Similarly, performances of these trials conducted at 16 locations during 2012-13 and details of some of those are depicted in table-6. Among these competitions IUB 222 out yielded (2590kg/hac) with 31.73 percent increase over standard check, MNH886 (1966kg/hac).

Zonal varietal trials (ZVT) conducted during2011-12, IUB222 was tested at farmer's fields in Bahawalpur and Multan divisions as shown in table-7 and gave significantly higher yield than check varieties. During 2012-13 again IUB222 gave evident performance at various locations. Hence, on the basis of zonal trials, it was indicated that this variety has good adaptability in different ecological zones.

Evaluation trials of IUB222 were conducted at Punjab Seed Corporation Khanewal for two years. Under these evaluations genetic line IUB222 was tested against 19 elite lines in 1.25 acre trial during 2011-12 and their recorded yield is presented in Table-9. The yield of IUB222 (45.59 mond/Ac) was highly satisfactory and higher than CIM598 and N-121 check varieties. During 2012-13, this variety out yielded remaining approved varieties at 86-87/10R farm against unapproved Bt varieties. Yield of IUB 222 remained on top with 32 monds/Ac (Table-10).

Testing of Bt protein:

The purity test based on presence of cry 1 Ac through striptest showed 100% pure (ABRIFD and NIBGE Faisalabad). The Bt. Protein in IUB222 was reported 5.03, 0.346 and 0.33 by ABRI Faisalabad, CEMB, Lahore and NIBGE respectively.

CLCuV Infestation:

The comparison of CLCuL incidence in house , PCCT and NCVT trials was performed and IUB 222 showed good genetic tolerance to CLCuV as the infestation remained 6.5% in PCCT2011-12 (Average of CRS Multan and CRS Vehari) in compare to MNH886(19.97%).

Fiber quality: Regarding quality traits of lint provided by various organizations in different experiments that fiber quality is acceptable (40.86lint %, 29.53 fiber length, 4.9 fiber fineness and UI 87.65 % higher than check variety MNH 886. Results obtained from quality traits trials in NCVT during 2012-13 that showed average fiber length from different trials at different locations 29 mm fineness and 4.58 mic which is best suitable for every stakeholder. While Results of quality traits of IUB222 showed in table-11 spot examination (Khanewal and NCVT) that average performance was observed as 40.33 % lint, 29.8mm fiber length,4.66 fiber fineness, 32.2 fiber strength and 89.82%Uniformity index from IUB222 higher than check variety MNH 886 and acceptable for textile industry of Pakistan.

Agronomic Studies: The performance of IUB222 was tested with other two varieties planting in 8 different sowing dates with15 days interval as shown in table- 12. It was found that IUB22 gave maximum yield from sowing March1 (9076 kg/ha) and March15 (8965 kg/ha). While in late sowings on June1 and June15 produced higher yields of 3291 and 2956kg/ha respectively than check varieties. It was concluded that IUB22 can be successfully cultivated after maize and sunflower harvesting. Plant spacing experiment was conducted to know the effect of plant population on yield of seed cotton of three newly lines; IUB222, MM-58 and MNH886 planted at

three different spacings during 2011-12 and 2012-13. The results showed that Best performance was observed under spacing (P×P=45cm) but performance of IUB222 was nearly same as 3396kg/hac in spacing 3351kg/hac in spacing (P×P=45cm). However, there is no significant difference in yield by maintaining the plant population.
As for entomological study concerned, the experiment was conducted at Department of Plant Breeding and Genetics, UCA&ES, The Islamia University Bahawalpur to assess its tolerance level against Jassid, Thrips, Whitefly, Bollworm damage and Mealy bug's attack compared with commercial variety CIM-496.The rate of pest population indicated that new variety IUB222 had equal level of tolerance against insect pests as commercial variety CIM496. Population per leaf was observed from IUB222 as 0.68 of jassid, 3.34 of whitefly, 4.81 of thrips and 0 % damage of boll worm compared with CIM496 as 0.76, 3.89, 6.75 and 9.76% respectively.

Seed Availability: The seed is multiplied by Punjab seed corporation and inquires regarding research purpose should be directed to corresponding author.IUB222 is recommended for Bahawalpur, Bahawalnagar, Rahim Yar Khan, M. Garah , D.G. Khan Khanewal, Vahari, Lodhran and Multan to yield potential 42-80 mond/Ac.

Justification for approval: CLCuV is a major threat to cotton production in Punjab. CLCuD infestation is increasing every year from last few years. The cotton line, IUB222 has developed keeping in view of CLCuD and water deficit problems. This variety is highly tolerant to CLCuD disease and gives good yield in water deficit areas. This variety possess good fiber quality trait with appropriate lint percentage. Approval for of this variety would stabilize the yield of cotton in Punjab and farmers would get higher yield with low inputs and in marginal soil.

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Table 1: Punjab seed corporation seed farms Khanewal, fibre testing report of 1.25 acre Bt Cotton and Non-Bt Cotton Kharif season 2012

Sr.#	Variety	GOT (%)	Staple Length (mm)	Uniformity Index (%)	Fineness (µg/inch)	Strength (g/tex)
Bt. Varieties						
1	IUB-222	40.0	31.1	92.0	4.5	29.5
2	SLH-4	38.5	30.0	87.9	5.1	30.6
3	FH-118	39.5	29.7	88.2	5.5	27.8
4	BZU-75	39.5	27.9	88.3	5.2	29.8
5	CEMB-44	41.0	27.7	84.2	5.7	31.4
6	CEMB-33	39.0	28.3	88.1	5.1	31.6
7	NIBGE-5	36.5	29.8	90.2	6.2	29.1
8	NIBGE-4	40.5	27.8	86.9	5.4	29.6
9	NIBGE-3	36.5	28.0	85.5	5.2	27.7
10	NIAB-824	39.0	28.9	87.3	5.0	26.0
11	VH-259	39.0	29.9	89.7	5.2	30.2
12	VH-303	39.5	29.0	86.7	4.1	29.5
13	VH-282	37.0	29.7	88.5	4.9	30.4
14	BH-180	41.0	29.3	89.6	5.3	30.1
15	BH-178	37.5	31.4	90.6	5.1	33.6
16	CIM-602	39.5	32.0	88.5	4.8	29.9
17	CIM-600	39.0	29.5	87.4	5.0	29.0
18	CIM-599	39.5	31.1	88.2	4.9	26.2
19	SUN-1	41.0	29.9	88.8	5.8	31.7
20	RS-1	40.5	28.3	86.2	5.6	28.3
21	LEADER-1	40.0	30.9	87.5	5.1	27.7

22	BT-161	39.5	33.0	89.6	4.4	31.5
23	SB-149	38.5	29.3	89.6	4.6	29.2
24	KZ-181	40.0	29.2	89.0	5.5	29.4
25	KZ-389	39.5	26.7	85.9	5.7	27.4
26	TARZAN-3	40.0	32.2	90.7	5.2	28.2
27	TARZAN-2	41.0	28.9	86.0	5.1	30.8
28	A-011	36.0	33.5	90.5	4.5	28.5
29	A-555	41.0	27.9	87.5	5.1	28.1
30	AGC-777	39.5	27.9	87.1	5.1	27.1
31	SILKEE	39.5	30.8	89.5	5.1	30.0
32	RCA-2	36.5	27.1	86.8	5.7	29.2
33	RCA-1	39.0	27.5	84.5	5.4	31.2
34	CR-333	39.5	28.4	88.6	6.1	29.1
35	SITARA-12	39.0	29.2	89.0	5.7	25.3
36	SITARA-11 M	39.5	32.0	92.4	4.6	31.7
37	SITARA-10 M	39.0	28.7	87.7	5.7	27.8
38	AURIGA-213	41.0	29.0	87.8	5.8	27.9
39	SAYBAN-202	40.0	28.2	86.7	6.2	26.0
40	SAYBAN-201	37.5	31.0	87.9	4.5	29.5
41	BGC-09	41.0	28.7	86.8	5.4	30.5

Table 2. Performance of IUB-222 (Yield kg/ha in different trial at IUB)

Name of experiment	Year	IUB-222	N-121	MNH-886
PYT 2	2010-11	2528	2192	-
AYT 3	2011-12	2742	2078	2672
AYT 4	2011-12	2678	2280	2385
AYT 1	2012-13	3352	2665	2850
AYT 2	2012-13	2870	-	2369
Bio safety trial	2012-13	3870	-	3250

Table 3. Comparative yield performance of IUB-222 in NCBT in Punjab during 2011-12:

Sr.#	Location	IUB-222	AA-802	IR-3701
1	CRI Faisalabad	2164	1464	1368
2	CRS Sahiwal	2440	1555	1340
3	CCRI Multan	3450	2750	2556
4	PSC KWL	3138	2869	2573
5	CRS R.Y. Khan	3225	3282	3117
6	Avg. Punjab	2884	2384	2191

Table 4. Comparative yield performance of IUB-222 in NCBT in Punjab during 2012-13:

Sr.#	Location	IUB-222	CIM-598
1	CRI Faisalabad	2929	2044
2	CRS Sahiwal	1594	592
3	CCRI Multan	2731	2137
4	PSC KWL	3175	2942
5	CRS R.Y. Khan	2980	1997
6	Avg. Punjab	2682	1942

Table 5. Comparative yield performance of IUB-222 in PCCT in Punjab during 2011-12

Sr.#	Location	IUB-222	IR-3701	MNH-886
1	CRI Faisalabad	2067	1457	1858
2	CRS Sahiwal	2815	2025	2175
3	CRS Multan	4158	2970	4218
4	CRS VEH	3707	2033	3110
5	CRI RY Khan	2674	2983	3395
6	CRS BWP	2906	2990	2906
7	Avg. Punjab	3056	2410	2944

Table 6. Comparative yield performance of IUB-222 in PCCT in Punjab during 2012-13:

Sr.#	Location	IUB-222	MNH-886
1	CRSS JHG	2105	1681
2	PSC KWL	1626	1210
3	CCRI Multan	3174	2601
4	ARS Karore	2850	2258
5	CRI RY Khan	3134	1823
6	CRS BWP	2650	2206
7	Avg. Punjab	2590	1966

Table 7. Comparative yield (kg/ha) performance of IUB-222 in ZVT during 2011-12:

Sr.#	Name of Grower	IUB-222	MNH-886	IR-3701
1	Fiaz Basheer Ex Sectory Agriculture, M.Gharh	2680	2597	2344
2	Ch. Imdad Hussain 18, WB Vehari	2495	2399	2188
3	Fozia Afzal Civil Judge BWP, Chishtian	2575	2410	2365
4	Syed Tabish Alwari, Yazman BWP	2715	2677	2103
5	Dr.Aleem chairan Dept. of statistic BWP	2637	2467	1917
6	Dr. Shair Awan, Lodhra	2477	2410	2170
7	Abbas Ali, Jahanian	3210	2965	2417
8	Ch. Liaqat Jahanian	2931	2375	1734
9	Malik Javaid 109/10R KWL	2917	2147	1974
10	Master Muhammad Iqbal, Chishtian BWN	2665	2310	2165
11	Tassawar Hussain Chattha, Vehari	2743	2577	2100
12	Malik Riaz Maitla Chak 147/10R KWL	2898	2489	2123

Table 8. Comparative yield (kg/hac) performance of IUB-222 in ZVT during 2011-12

Sr.#	Name of Grower	IUB-222	MNH-886	IR-3701
1	Ch. Imdad Hussain, 18 WB Vehari	2695	2578	2389
2	Fiaz Basheer Ex Sectory Agriculture, M.Gharh	2890	2647	2260
3	Fozia Afzal Civil Judge BWP, Chishtian	2591	2488	2193
4	Ghulam Ahmad Chak 70 Yazman, BWP	3143	2987	2315
5	Syed Tabish Alwari Yazman, BWP	3098	2742	2107
6	Riaz-ul-haq, Khan Pur	2944	2765	1940
7	Dr. Aleem Chairman Dept. of Statistic BWP	2549	2210	2123
8	Ch. Abdul wahab cak 16 DNB, BWP	2688	2393	2039
9	Dr. Shair Awan, Lodhran	2402	2396	2198
10	Majid Abbasi, Khair Pur Tamewali BWP	2587	2471	2283
11	Abbas Ali, Jahanian	3388	2699	2365
12	Yar Muhammad, Channi Ghoth RYK	2866	2512	2193
13	Ch. Liaqat, Jahanian	2981	2470	2239
14	Malik Javaid, 109/10R KWL	2697	2543	2105
15	Master Muhammad Iqbal, Chishtian BWN	2570	2465	1917
16	Tassawar Hussain Chattha, Vehari	2917	2852	2187
17	Malik Akhtar Hussain, Shujabad Multan	2971	2601	2319

18	Syed Shifat Bhukhari, Shujabad Multan	2855	2799	2250
19	Dr. Tariq Abbas Cordiologist, Multan	2539	2486	2196
20	Dr. Khalid Abbas Child specialist, Nishter Uch Sharif BWP	2706	2543	2298
21	Auriga chemicals, Lahore Mailsi	3137	2871	2365
22	Ansar Wraich, Borewala	2781	2697	2273
23	Abid Mehmood, Layyah	3133	2793	2159
24	Malik Iqbal, Sadiq Abad	2743	2670	2256
25	Fakher Imam, Kabir Wala	3289	2891	2309

Table 9. Results of PSC Khanewal for 1.25 Acre Block Year 2011-2012

Sr #	variety	Yield/ acre (mds)	Sr #	variety	Yield /acre (mds)	Sr #	variety	Yield /acre (mds)	Sr #	variety	Yield /acre (mds)
1	RH-625	35.23	15	TARZAN-1	41.32	29	RCA-2	30.89	40	V-17	45.12
2	FH-142	45.68	16	VH-259	42.06	30	RCA-1	33.51	41	V-15	42.50
3	FH-114	59.77	17	VH-282	37.59	31	CA-12	48.75	42	SITARA	40.06
4	FH-4243	43.91	18	IUB-222	45.59	32	CA-11	32.50	43	009	52.44
5	IR-4	44.41	19	IUB-2009	41.58	33	AA-906	33.99	44	MNH-886	40.00
6	IR-3	38.05	20	IUB-212/11	47.32	34	AA-904	42.62	45	MNH-456	41.25
7	IR-901	41.23	21	IUB-222/10	44.61	35	KZ-389	28.33	46	PSC-4	46.19
8	BT-141	36.86	22	IR-NIAB-824	40.31	36	SB-149	32.68	47	PSC-3	41.25
9	BT-131	45.18	23	SAYBAN-201	47.28	37	KZ-191	33.10	48	PSC-2	49.58
10	BT-121	33.18	24	AVRIGA-213	42.72	38	KZ-181	31.25	49	CEMB-2	38.24
11	BT-178	40.86	25	SILVER LINE 40	37.32	39	A-555	34.11	50	4-B-E-1	37.98
12	CIM-304	40.27	26	CIM-602	31.72	40	A-04	31.49	51	4-B-E-2	35.60
13	CIM-306	39.91	27	CIM-599	32.02	41	A-ONE	29.46	52	SILVER STAR-117	35.16
14	SILKEE	34.41	28	CIM-598	38.27	42	CBS-02	44.25			

Table 10. Daily Picking Report of Seed Cotton at PSC seed farms Khanewal as on 18.02.2013

S.No.	Name of Variety	Category/ Source	86-87/10-R		
			Area (Acres)	Produc. (Kgs)	Y.P.A (Mds)
Bt varieties					
1- Approved					
1	ASR-703	BNS	9.60	12190	31.74
2	FH-114	BNS Kwl.	19.20	13069	17.02
3	Tarzen-1	BNS Kwl.	12.00	8358	17.41
4	BT-121	-	2.40	1473	15.34
5	BT-141	-	12.00	15167	31.60
6	IR-3701	-	4.80	3638	18.95
7	CIM-598	Breeder Seed	4.80	4903	25.54
8	MNH-886	BNS Kwl.	57.60	57041	24.76
		Pre-basic	14.40	20167	35.01
2- Unapproved					
1	CA-12	H-8, 124	9.60	8904	23.19
2	Syban	H-68	4.80	2426	12.64
3	IUB-222	-	9.60	12351	32.16
4	Sitara-09	-	4.80	5458	28.43
5	PSC-1	-	4.80	2881	15.01

Table 11. Summary of Fiber Traits of IUB-222

Variety	Trial	Lint %	Fiber Length(mm)	F. Fineness (ug/inch)	Fiber Strength(g/tex)	U.I %
IUB-222	Spot Examination	40.86	29.53	4.9	34.7	87.65
	NCVT	40.13	28.78	4.6	32.4	-
	PSC	40	31.1	4.5	29.5	92.0
	Average	40.33	29.8	4.66	32.2	89.82
MNH-886	Spot Examination	40.77	28.6	4.56	31.1	85.06
	NCVT	39.92	27.95	4.56	32.1	-
	PSC	-	-	-	-	-
	Average	40.34	28.27	4.56	31.6	85.06

Table. 12. Yield Record (kg/ha) in Sowing Date Trial

Sowing Date	IUB-222	MM-58	IUB-09
SD_1 (1/3)	9076	8892	8261
SD_2 (15/3)	8965	8851	8072
SD_3 (1/4)	6053	7384	7467
SD_4 (15/4)	5473	6597	6734
SD_5 (1/5)	4067	5384	5641
SD_6 (15/5)	3547	4138	4082
SD_7 (1/6)	3291	3062	2873
SD_8 (15/6)	2956	2287	2065
CD @ 5% For Sowing date	105		

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