Comments on Protocols for Agronomic Performance Evaluation of GM Mustard Hybrid DMH-11

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ICAR-Adopted Protocol & Criteria for mustard variety / hybrid release

S. No	Specifications	Recommended protocol of ICAR	Case of DMH-11	Remarks
1	Minimum number of Years	**At least 3 in each zone**	**NOT** followed	If trials are less than the recommended protocol the trial is repeated
2	Minimum number of Locations	**Minimum 3 each year in each Zone**	**NOT** followed	Only 8 trials in the case of DMH-11 in all. * In Zone II, applicant has taken 2 trials in 2 locations in BRL I (1st year), 1 trial in 1 location in BRL I (2^{nd} year) and 3 trials in 3 locations in BRL II (6 trials). * In Zone III, 1 trial in 1 location in BRL I (1^{st} year) and same in 2^{nd} year (2 trials).
3	Check / Comparators Selection	For hybrid trials, **hybrid checks are essential**	**NOT** followed	(In addition to Hybrids, Recommended Zonal and National Checks of Varieties are also used in ICAR protocols)
4	Release/ Notification			Minimum 10% higher seed/oil yield over existing best Check

Does GEAC evaluation pass scientific muster? Criteria for Promotion of New Cultivar

Proper Evaluation is necessary, which includes:

- Zone wise Evaluation
- Trials should be conducted in at least 3 locations in each zone.
- At least 10% gain over existing best checks either in terms of seed / oil yield.
- Trials should be conducted for at least 3 years
- Trials are conducted by coding the names of cultivars, so human bias is avoided.
- Proper Scrutiny in scientific fora - AICRPRM

Ref: AICRPRM Proceedings

Can we afford to make exceptions for GM crops??

Violation of RCGM and GEAC Decisions in 2010-11 trials

Decisions in GEAC meetings	**Permission Letter**	**Recommended Vs. Actual**	**Remarks**
BRL I 1st Year Trials permission, 103rd meeting of GEAC, 29/9/10: "6.3.2 Transgenic parents Varuna *barnase* (event bn3.6) and EH2 *barstar* (event modbs2.99), one non-transgenic parent (EH2), one national check (varuna) and one zonal check would be planted along with transgenic mustard hybrid DMH-11"	No. BT/BS/17/30/97-PID, dated 15/10/2010, by Member Secretary RCGM in DBT: "a) 1) To generate biosafety data with focus on environmental safety assessment parameters …on productivity of transgenic mustard hybrid DMH-11 corresponding to **non-transgenic counterparts and checks**.	Recommended checks during BRL I trial: National – 1.Kranti (variety) 1982 2. DMH-1 (hybrid) 2008 Zonal – Zone II- NRCDR-2 2006 Zone III- RGN-73 2006 **Actually used** National Check :- Varuna 1975 Zonal checks: Zone II RL-1359 1987 Zone III Maya 2002	**Applicant has used convenient checks instead of Decided**, or **Permitted**, or **Recommended** which amounts to rigging of trials to get favorable data.

Violation of RCGM and GEAC Decisions in 2011-12 trials

Decisions in GEAC meetings	**Permission Letter**	**Recommended Vs. Actual**	**Remarks**
BRL I 2nd Year Trials Decision, 112th GEAC meeting on 21/9/2011: "5.14.4 It was also noted that the trials will be done in Randomized Complete Block Design with six replications **with transgenic and non-transgenic mustard hybrids**"	Letter No. BT/BS/17/30/97-PID, dated 17/10/2011, from Member Secretary, RCGM: i) **Appropriate National and local checks** and spacing are to be included for comparison of the efficacy of the gene in terms of productivity…..	Recommended checks during BRL I trial: National – 1.Kranti (variety) 2. DMH-1, NRCHB-506 (hybrids) Zonal – Zone II- NRCDR -2 Zone III- RGN-73 **Actually used:** National check: Varuna Zonal checks: Zone II- RL-1359 Zone III- Maya	**Applicant has used convenient checks instead of Decided or Recommended** which amounts to rigging of trials to get favorable data

VIOLATION OF RCGM AND GEAC DECISIONS BY APPLICANT OF DMH-11 IN 2014-15 TRIALS

Decisions in GEAC meetings	**Permission Letter**	**Recommended Vs. Actual**	**Remarks**
BRL II Trials Decision, 121st GEAC meeting on 18/7/2014: "4.4.4 The Committee took note of the field experiment design and proposed isolation measures as given below: Randomised Block Design with five replications **with transgenic and non-transgenic mustard hybrids".**	File No. 12013/35/2010-CS-III, dated 28/10/2014 and 7/11/2014, from Member Secretary GEAC: "7.0 Trial Protocol: **Appropriate national and local checks** and spacing are to be included for comparison of the efficacy of the transgenic mustard hybrid and parental lines in terms of productivity…."	Recommended checks during BRL II trial: National – 1.Kranti (variety) 2. DMH-1, NRCHB-506 (hybrids) Zonal – Zone II- RH0749 2013 Zone III- RGN-73 **Actually used:** National check : Varuna Zonal checks: Zone II- RL-1359 Zone III- Maya	The mentioned checks were recommended by ICAR for the trials but applicant has **used convenient checks instead of Decided or Recommended** which amounts to rigging of trials to get favorable data. Moreover, variety Varuna was recommended as national check only upto 2006-07 season and subsequently the recommendation for Varuna was withdrawn.

CHECK YOUR CHECKS (ZONE II) FOR HYBRID TRIALS

Years and Stage of Trials	Recommended by AICRP-RM			Used for testing DMH-11		
	Zonal Check	National Check	Latest Release / Hybrid Check	Zonal Check	National Check	Latest Release/ Hybrid Check
2010-11 BRL I, 1st year	NRCDR-2	Kranti	DMH-1 NRCHB-506	RL-1359	Varuna	-
2011-12 BRL I, 2nd year	NRCDR-2	Kranti	DMH-1 NRCHB-506	RL-1359	Varuna	-
2014-15 BRL II	RH-0749	Kranti	DMH-1 NRCHB-506	RL-1359	Varuna	-

Comments:

1. **Not a single BRL trial** is conducted as per recommended check.
2. **Not a single hybrid ever used as a check.** Being a hybrid, DMH-11 MUST be compared with hybrid.
3. This is **against the protocol and conditions** in the permission letter.

Ref: AICRP Proceedings and BRL Trial Reports

CHECK YOUR CHECKS (ZONE III) FOR HYBRID TRIALS

Years and Stage of Trials	Recommended by AICRP-RM			Used for testing DMH-11		
	Zonal Check	National Check	Hybrid Check	Zonal Check	National Check	Hybrid Check
2010-11: BRL I- 1st year	RGN-73	Kranti	DMH-1	Maya	Varuna	-
2011-12: BRL I- 2nd year	RGN-73	Kranti	DMH-1	Maya	Varuna	-
2014-15: BRL II	RGN-73	Kranti	DMH-1	Maya	Varuna	-

Comments:

1. **Not a single BRL trial** is conducted as per recommended check.
2. **Not a single hybrid ever used as a check.** Being a hybrid, DMH-11 MUST be compared with hybrid.
3. This is **COMLETE VIOLATION of the protocol Decided in GEAC meetings, and conditions** in the permission letter.

Ref: AICRP Proceedings and BRL Trials Reports

Are these claims for yield justified?

- Minimum trials not conducted across zones.
- Minimum years yield evaluation not done.
- Old/outdated national check used.
- Old/outdated zonal checks used.
- GEAC decisions and permission conditions were violated.

- DRMR-RM has only performed duty of postmaster for onward transmission of data received from DUSC/NDDB staff to GEAC.

NO

Seed Yield (kg/ha) of transgenic mustard hybrid trials conducted during 2006-07 under the supervision of NRCRM, Bharatpur, ICAR

Entry	Delhi	Bharat pur	Kanpur	Pant-nagar	Nav-gaon	Srigang anagar	Kota	Gwalior	Hisar	SK Nagar
Varuna	1395	565	1168	952	1111	1527	2466	592	771	1690
Kranti	1503	940	1380	1232	1097	1606	2433	880	889	2272
Zonal Check	1313	1003	1577	1208	1002	1344	2368	755	740	2295
DMH-1	**1884**	**1098**	1110	**1666**	**1434**	**1501**	**2488**	1289	1302	1975
DMH-11	1748	923	1319	1311	1264	1370	2325	1347	1553	2349

Reference : Reports from AICRP-RM, DRMR

Seed Yield (Kg/ha) performance of DMH-11 in AICRP MLRT (2006-07)

Strain	Seed Yield (Kg/ha)		DMH-11 % percentage increase
	Range	Mean	
Varuna	565-2466	1224	26.7%
Kranti	880-2433	1423	9%
Zonal Check	755-2368	1361	14%
DMH-1	1098-2488	**1575**	**-1.5%**
DMH-11	923-2349	**1551**	-

Comments:

1. **There was only one Year of testing against another Hybrid, DMH-1.**
2. **In that Year, DMH-11 did not outperform DMH-1 significantly, nor even outperform.**
3. **From the next year of testing onwards, comparison with another Hybrid is DROPPED. WHY?**

Reference : Reports from AICRP-RM, DRMR

WHY & HOW DID THIS RIGGING HAPPEN?

- Despite a Decision taken in the GEAC meeting of testing DMH-11 against Hybrids, why did the permission letter allow diluted protocols by using the term **Appropriate**?
- Despite the permission letter for the trial laying down that DMH-11 should be evaluated against appropriate local and national checks, and against non-transgenic counterparts and checks, why was the applicant allowed to choose convenient checks? *NON-TRANSGENIC CANNOT BE INTERPRETED AS HANDMADE ISOGENIC HYBRID BUT NON-TRANGENIC HYBRIDS ALREADY AVAILABLE AS IS THE PROTOCOL FOR AGRONOMIC EVALUATION*
- Despite scores of scientists putting themselves through the AICRP-RP protocols, why was a transgenic developer allowed a lax protocol?
- How come a hybrid comparator was used in one year but dropped from the next trial onwards?

WHO ALLOWED THIS?

CAN DEVELOPERS DO WHATEVER THEY PLEASE?

WHY WERE TRIALS ALLOWED YEAR AFTER YEAR WITH SUCH DILUTIONS WITHOUT ANY REVIEW OR RECTIFICATION BY REGULATORS? **IN FACT, THERE SHOULD HAVE BEEN STRICTERPROTOCOLS FOR A GM CULTIVAR THAN EVEN ICAR PROTOCOLS.**

THE HASTE OF THE REGULATORS AND CROP DEVELOPERS IS IN PASSING OFF "ENVIRONMENTAL SAFETY STUDIES" AS "AGRONOMIC EVALUATION" OF YIELD CLAIMS.

Claim Made by the Developer

Variety	Mean Seed Yield kg/ha			Overall mean	% Increase over check
	2010-11	2011-12	2014-15		
Varuna	2093	2617	1887	**2199**	**28.41**
Varuna Barnase	2096	2640	1861	2199	
EH-2	1897	2007	1378	1761	
EH-2 Barstar	2009	1856	1558	1808	
Zonal Check	2037	2323	1776	**2045**	**38.05**
DMH-11	**2600**	**3485**	**2386**	**2824**	

-:Claim:-

28.4 % more yield than Varuna (NC) and

38.1% more than Zonal Check, from 8 trials.

Ref: BRL data submitted by crop developer to GEAC

REALITY OF YIELD ADVANTAGE OF DMH-11 OVER EXISTING VARIETIES/ZONAL CHECKS (ZONE II)

Cultivar	Year of Trials	Number of trial years	Number of Trials	MSY (Kg/ ha)	% Difference in MSY of DMH-11 over respective cultivar
Varieties (MSY based on AICRP trials)					
RH-749	**2009-10, 2013-14, 2014-15**	**3**	**20**	**2553**	**3.3**
DRMRIJ-31	**2010-11 to 2012-13, 2014-15**	**4**	**28**	**2481**	**6.3**
NRCDR-2	**2003-04 to 2005-06, 2009-10 to 2013-14**	**8**	**111**	**2297**	**14.8**
Transgenic Hybrid (MSY based on BRL trials)					
DMH-11 (Only BRL Trials)	2010-11, 2011-12, 2014-15	**3**	**6**	**2638**	

Comments:

1. Yield advantage of DMH 11 over two existing varieties/zonal checks is less than 10 % in Zone II
2. AICRPRM- Reports

REALITY OF YIELD ADVANTAGE OF DMH-11 OVER EXISTING HYBRIDS/CHECKS (ZONE II)

Cultivar	Year of Trials	Number of trial years	Number of Trials	MSY (Kg/ ha)	% Difference in MSY of DMH-11 over respective cultivar
Hybrids (MSY based on AICRP trials)					
DMH-1*	2004-05, 2009-10 to 2014-15	7	42	2559	3.1
NRCHB-506*	2005-06, 2009-10 to 2014-15	7	35	2300	14.7
CORAL-437	2006-07 to 2008-09, 2010-11	4	20	2542	3.8
Transgenic Hybrid (MSY based on BRL trials)					
DMH-11 (Only BRL Trials)	2010-11, 2011-12, 2014-15	3	6	2638	

Comments:

1. Yield advantage of DMH 11 over two existing hybrids/checks is less than 10 % in Zone II
2. AICRPRM- Reports
3. *National checks

1000 SEED WEIGHT AND OIL CONTENT (%) FOR LATEST RELEASES, CHECKS AND DMH-11

Varieties/hybrids	1000 seed weight (g)	Oil content (%)
RH 0749	6.9	39.2
DRMRIJ 31	4.9	40.0
NRCDR 2	5.2	40.1
DMH 1	3.9	39.9
NRCHB 506	4.5	39.9
Coral 437	4.0	39.7
DMH 11	**3.3**	40.2

AICRPRM- Reports

CONCLUSIONS

- Recently released *Varieties* RH-0749 (2013) & DRMRIJ 31 (2014) gave similar yield to transgenic hybrid DMH-11in Zone II.
- MLT data indicates that non-transgenic *hybrids* DMH-1 and CORAL-437 also gave similar yield over transgenic hybrid DMH11 in Zone II.
- DMH-11 has no yield advantage over varieties and hybrids released in recent years.
- In such a case, how will DMH-11 result in higher yields and reduce the oil import bill of India? Only by comparing itself with earlier Checks, by breaking decisions, permission conditions and AICRPRM recommendations? By showing 'environmental safety studies' as 'agronomic evaluation'?

Why should DMH-11 be released and on what basis?