

DR. HARSHA VARDHAN

08-06-2017

Cabinet Minister

Ministry of Science & Technology, Environment, Forest and Climate Change

Indira Paryavaran Bhavan, Jorbaugh , New Delhi-110003

Subject: Approval of Brassica transgenic hybrid DMH-11 by GEAC (Ministry of Environment, Forest and Climate Change)

Respected Sir,

It has been learnt from the reliable source that on 11th May, 2017, the Genetic Engineering Appraisal Committee (GEAC) working under the jurisdiction of your ministry has approved the genetically modified mustard hybrid DMH-11 and recommended for final approval from the ministry. In a general sense, while releasing any crop variety for the commercial cultivation, it is expected from the Environment Ministry to see whether all the broad environmental safety protocols have been properly followed as well as all the trials related to the biosafety measures for the products/varieties/transgenic hybrids have been carried out as per the guidelines of the safety assessment of the transgenic hybrids or not. However, in case of transgenic mustard, DMH-11 required protocols have not been followed, and GEAC ignored it. Hence, before granting the final approval, I personally request you to look into the matter carefully. Regarding biosafety trials of the said variety, the GEAC has been provided with misleading information by the developers which was taken into consideration by GEAC for the approval.

In this connection, I would like to focus on some of the issues related with the release of any variety to the farmers. The Seed Act 1966 empowers Central Seed Committee of Ministry of Agriculture, Government of India, to accept or reject a hybrid/variety or genotype for commercial cultivation. I strongly feel that GEAC (Environment Ministry) should look for the environmental and bio-safety aspects of the transgenic variety/hybrid. While for commercial cultivation on farmers' field the evaluation of the hybrid should be strictly done as per the Seed Act, 1966; which is not done for DMH-11. However, before the release of DMH-11, for commercial cultivation, the developer did not follow any protocols mentioned in the seed act and taken the approval for the release of the variety with the help from RCGM of DBT and GEAC of your ministry.

Experience with transgenic Bt-cotton in past, showed that approval of GEAC (Ministry of Environment) is used by seed industry for licensing the transgenics as research varieties/hybrids for large scale commercial cultivation on farmers field. The approval of GEAC has sidelined regular procedure and mandate under the Seed Act, 1966 and brought out nearly 650 Bt-transgenic hybrids in the market creating the chaos. Such kind of possibility exists, with DMH-11 which carries transgenic dominant male sterility and herbicide tolerant traits harmful towards biodiversity.

According to the developer the ICAR has conducted the evaluation trials (BRL) during 2010-14 and assessed for three years. However, it is crystal clear from the documents borrowed on RTI query received from then Director, ICAR-Directorate Rapeseed Mustard Research, Bharatpur (DRMR) that the trials were conducted as per the guidelines given by GEAC which differ with AICRP policy of Ministry of Agriculture, Gov. of India. The testing protocol was given by the Delhi University (DU). DRMR Bharatpur has not conducted any trials, but only the trial locations of AICRP were used for evaluation. The data generated by DU/NDDDB staff was passed on to DRMR for onward transmission to DU/GEAC. For the same DRMR, Bharatpur have no raw data of each location available with them. DRMR acted as postman for the above purpose (Appendix-1). Hence, it is my earnest request to you to look into the matter carefully before granting the final approval from your ministry.

I must mention here that the transgenic mustard hybrid, DMH-11 has been developed by the Centre of Genetic Manipulation of Crop Plants (CGMCP) of Delhi University. For assessment and biosafety trials, Delhi University had received sum of Rs. 210 million and about Rs. 70 million from National Dairy Development Board (NDDDB), Anand and DBT, Ministry of Science and Technology, respectively. At the same time, a project with outlay of sum of Rs. 45 million was also initiated at Nagpur University, Nagpur, Maharashtra, which was financed by the National Dairy Development Board (NDDDB). The project initiated during 1992-93 was extended further up to June, 2017. This project has the major contribution of development of EH-2, one of the parent of DMH-11. Initially, in 1999, I joined the project as a consultant to NDDDB which was later shifted to Nagpur University, and have carried out the work single handedly till March, 2013. The authentic record available with us says that DRMR, Bharatpur evaluated DMH-11 along with non-transgenic hybrid, DMH-1, during 2006-07 at 10 different locations throughout the country. The yield evaluation data indicated that DMH-1 has shown numerical superiority (1575 kg/ha) over DMH-11 (1551 kg/ha) (Appendix-2) and the seed size was (1000 seed weight) 3.9 and 3.1g, respectively (Appendix-3). Both hybrid were with small sized seeds. Later, for the first time in the country, in 2008-2009, DMH-1 and NRCHB 506, two non-transgenic hybrid from the public sector and Coral-432 from private sector, were released and notified by Ministry of Agriculture, Government of India.

Meanwhile, NDDDB, Anand has constituted an Expert Committee under the chairmanship of Dr. Anupam Varma, Retd. National Professor, ICAR to advice on a road map of regulatory approval from GEAC and Government of India and formulation of BRL-1 and 2 trials during 2010 to 2014. The expert committee consisted of three members from ICAR, 2 each from MDFVPL and Delhi University, one each from NIN and Health Ministry. These members were also associated with GEAC and this type of decision is the blatant violation of scientific ethics. This was deliberately done so as to get the approval from GEAC in the easiest way. Surprisingly and unfortunately the Expert Committee formulated the BRL trials, which were blindly accepted by GEAC. The committee did not follow the norms of release and notification outlined by Central Seed Committee. As a matter of facts, two non-transgenic hybrids and the checks of ICAR trials both, national and zonal checks, were omitted and the checks which were used from the national trials during 2007 and 2008 were included to claim the superiority of the hybrid. I wonder **“Why the ICAR scientists did not object to this omission?”**

Following anomalies created the dilemma regarding the check varieties in BRL trials.

1. During 2010-11 GEAC recommended Varuna as a national check which was set aside in ZONE-II by AICRP on Rapeseed Mustard in 2007-08. At the same time RCGM recommended non-transgenic counterpart (DMH-1) and checks *in Vogue*. Recommended national check was 'Kranti' and zonal checks were 'NRCDR-2' for Zone II and 'RGN73' for Zone 3. As against the checks used in BRL-1 were Varuna as national check and RL 1359 for Zone-II and 'Maya' for Zone-III. Thus the BRL-1 missed the appropriate checks.
2. For BRL-2 (2011-12) GEAC recommended non-transgenic Mustard hybrid (DMH-1). But the RCGM over ruled and recommended appropriate national and local checks *in Vogue*. As per the recommended norms of AICRP appropriate checks were same as during 2010-11 which were totally ignored and used convenient inferior checks Varuna (national checks), RL1359 in (Zone-2) and Maya (Zone-3)
3. For repeat BRL-2 (2014-15) GEAC recommended non-transgenic Mustard hybrid (DMH-1). RCGM again over ruled and recommended appropriate national and local checks *in Vogue*. It was again ignored and used the inferior checks Varuna (national checks), RL1359 in (Zone-2) and Maya (Zone-3).
4. Varuna (the then national check) was set aside in ZONE-II by AICRP on Rapeseed Mustard in 2007-08. At the same time non-transgenic counterpart (DMH-1) recommended to be a check by RCGM and recommended national checks 'Kranti' and zonal checks 'NRCDR-2' for Zone II and 'RGN73' for Zone 3 were not used. As against the checks the BRL trials were planned with 'Varuna' as national check and RL 1359 for Zone-II and 'Maya' for Zone-III. Moreover, the planners were the developers of DMH-11. The trials were conducted by staff appointed by Delhi University (under NDDDB grants) and sidelined the ICAR authorities while conducting the BRL trials although the locations were from AICRP centers of ICAR.
5. Thus, based on the manipulated and rigged data transgenic hybrid DMH-11 was reported to give **28 % higher yield over Varuna (ageold abandoned check)** (Appendix-2).

Since the appropriate checks were not used in the BRL-1 & 2 trials, the data in respect of standing high yielding varieties/hybrid checks, generated in ICAR-AICRP trials over the years is presented in Appendix III. The study of the compiled data from Appendix III reveals that recently released varieties RH-0749 (2013) and DRMRIJ-31 (2014) and NRCDR-2 (2006), exhibited 12.5-26.2% higher yield over transgenic hybrid DMH-11 (Reported by developers) in zone II. Multilocation trial data indicates that non-transgenic hybrid DMH-1 and Coral 437 and NRCHB-506 gave 10-27% higher yield with higher test weight than transgenic hybrid DMH-11. Thus, it is not clear **“How will DMH-11 results in higher oil production and reduce the oil import bill of India?”**

Wrong claims by developers:

1. As explained by Developer of DMH-11 to *SciDevNet* “It has the potential to increase yields and build disease resistance”. CGMCP has submitted to GEAC its own positive self-assessment for biosafety while applying for the release of GM mustard.

2. DMH 11 hybrid, created by inserting barnase-barstar genes created from Indian and **East European mustard strains** — could increase mustard oil yields by 30 to 35 per cent. Barnase-barstar genes, derived from the soil bacterium *Bacillus amyloliquefaciens*, allow control of sterility and fertility in hybrid crops. These claims are ruled out as the checks used in BRL trials were not proper. Moreover as seen in the reports of DRMR Bharatpur DMH-11 has 40.2% oil content against 40.1% in NRCDR2 (App-I).

Secondly, about the origin of the male parent of DMH-11 viz., EH-2; there is an interesting story. EH stands for ‘Early Heera’ developed by Nagpur University (NU) which is a mutant of genotype ‘Heera’. developed in late 90s under collaborative program on “Zero-Zero mustard genotypes” between NU and Canadian Scientist Dr Downey.

Thirdly, Barnase-barstar system in seed production program needs herbicide “Glufosinate Ammonium” (Basta) which is under patent regime held by Bayer, the German multinational.

2. It is said that GM mustard, had been 14 years in the making; the efforts will go waste and it will be a setback for Indian agri-biotech research if DMH-11 is not delivered. It is very unfortunate that when the hybrid could not prove its superiority over non-transgenic hybrid and recently bred varieties, the spread of such low yielder will result in suffering of millions of farmers and our nation as a whole. Research is a continuous process and it should aim to the superior outcome.

Important observations about environmental hazards with DMH-11:

DMH-11 carries dominant male sterility (MS) gene which can be transferred to local variety/improved varieties under cultivation as well as to useful wild germplasm through open pollination. It may lead to the increase in percentage of male sterile plants under cultivation year after year. This dominant sterility can be restored only with ‘barstar gene’ present in male parent (EH-2) of DMH-11 but not in other germplasm/cultivated varieties. For this reason, in near future, it will lead to spread of male sterility through open pollination in the cultivated varieties with reduced yield. Consequently the local / improved varieties are likely to suffer and thrown out of cultivation.

The female parent of DMH-11, carries two types of plants, one is male sterile closely linked with herbicide tolerant (HT) gene and others male fertile with closely linked counterpart of HT resulting to herbicide susceptibility. In hybrid seed production, female rows are sprayed with herbicide “BASTA” (Commercial product of Byer), killing the fertile plants to allow the cross of male parent with the sterile HT plants. Thus, DMH-11 carries HT gene and is herbicide tolerant.

Possible use of HT technology in Mustard, is likely to encourage the use the same in other food crops in India like rice, wheat, sorghum, maize, sunflower, pigeonpea etc. where the

hybrids are popular. It may lead to monopoly in hybrid seed by MNCs holding the IPR for herbicides and HT genes as well.

Wide spread of HT crop varieties/ hybrids may contribute to the development of super weeds In near future as an evolutionary consequence which is likely to be difficult to control. This will be not only dangerous to the environment but also to the entire farming community of the country.

The herbicide 'glufocinate' is a known carcinogenic. Once the use of herbicide is approved for seed production, it is likely to go to the commercial crops unethically, through the traders and our innocent farmers for controlling the weeds exposing the population to the hazardous effect of the herbicides.

All these facts are totally ignored by GEAC while testing for environmental safety and has given the approval to DMH-11.

Surprisingly, the biosafety data generated for safety of DMH-11 was not disclosed to the public domain, by the Assessment of Food and Environment Safety Committee (AFES), however, only observations were mentioned in its report. The GEAC has ignored the orders issued by Hon'ble Supreme Court and the Central Information Commission regarding the disclosure of data on field trials on the ground of trade secret and confidentiality.

The officials of three ministry namely Ministry of Agriculture (NDDB and ICAR), Ministry of Science & Technology (DBT, RCGM), Enviroment ministry (GEAC), CGMCP of Delhi University were involved in the development and decision making process of release of DMH-11 and giving clearance for commercial cultivation. I personally feel that all the officials including GEAC have done the unethical work with biased approval to the transgenic DMH-11 as environmentally safe. This is a a case for further investigations.

Sir, considering the aforementioned facts and the misleading information provided by the developer regarding the high yield and superiority of the transgenic hybrid, the unethical and illogical decision has been taken by the GEAC for granting approval to DMH-11. I failed to understand the formality carried for the approval of DMH-11 by GEAC ignoring the environmental safety as well as agronomical inferiority. It will affect the entire farmer community growing Mustard in this country.

To summarize the shortcomings of DMH-11 following points are being brought to your kind notice.

1. Proper protocol for agronomic suitability has not been followed.
2. Misleading and false information regarding the biosafety measures and high yield has been provided by the developer.
3. Use of herbicide tolerant (HT) technology regarding DMH-11 was kept hidden from the regulators.
4. Possible use of HT technology in crops will contribute to the development of super weeds and will be difficult to control.

5. Dominant male sterility may endanger the brassica germplasm as well as wild germplasm due to spread of male sterile plants through open pollination.
6. Monopolization of seed industry by MNC by controlling the IPR on glufosinate which is used for hybrid seed production.
7. Health hazard of the carcinogenic herbicide is ignored.

The approval granted by GEAC for DMH-11 hybrid is a case for detailed investigations, since the standard protocols and the procedure is not followed by the developer. The GEAC has approved the variety without looking into the safety aspects and the future impact on the entire farmer community in the country. Hence, you are requested to look into the matter carefully before granting the final approval to the variety. Being a learned person in the field and playing a part of aware citizen of the country, I tried my level best to make you aware of the facts regarding the hybrid to be brought into market which will affect the future generation.

With warm regards,

Sincerely yours',

(S.E.Pawar)

FNAAS, FNASC, Ex. Scientist
Nuclear Agriculture and Biotechnology Division BARC, Mumbai-85
Flat No. 404, Riddhi Siddhi Apartment,
Hindusthan Colony, Amravati Road,
Nagpur-440033 (MS) Email:sepawar@gmail.com, (M): 09820518757

Enclosures:

1. Appendix 1: Information procured on DMH-11 from DRMR, Bharatpur, under RTI Act-2005.
2. Appendix 2: Report from AICRP-RM, DRMR showing data on yield attributes of DMH-11 and data on the claims made by the developer.
3. Appendix 3: Data from AICRP- Rapeseed Mustard, DRMR Bharatpur.

Copy for information:

1. Hon'ble Renuka Chaudhari, Chairperson, Parliamentary Standing Committee,
2. Hon'ble, Shri Radha Mohan, Minister of Agriculture, GOI
3. Vice Chairman, NitiAayog, New Delhi
4. Chairman, NDDB, Anand, Gujarat
5. Director General, ICAR, New Delhi
6. Hon'ble Chief Justice, Supreme Court Of India

From: Director Drrm [mailto:director.drrm@gmail.com]

Sent: 29 April 2016 18:28

To: Aruna Rodrigues

Subject: Re: RTI MUSTARD CPIO DRMR Bharatpur 25 april 2016 --- Email signed copy

Dear Madam

Please find attached herewith point wise information in respect of RTI letter requesting information on rapeseed -mustard and Mustard DMH 11. If any query arises, please feel free for clarification.

With Kind regards

Dhiraj

On 28 April 2016 at 05:37, Aruna Rodrigues <arunarod@gmail.com> wrote:

Dear Sir

I have despatched today by Speed Post the enclosed RTI letter requesting information on rapeseed -mustard and Mustard DMH 11. The relevant receipt No is

EI 831488126IN

I look forward to an early reply.

Thank you

Yours faithfully

Aruna Rodrigues
Sunray Harvesters,
Bungalow 69
Mhow - 453441
M.P. India

Director

ICAR - Directorate of Rapeseed-Mustard Research

Bharatpur 321 303, Rajasthan

Phone: 05644-260379, 05644-260419,05644-260495(O),

Fax: 05644-260565, 05644-260212(R)

S.No.	Question	
1.	A. THE NORMS AND RULES	
i	<p>The norms and rules governing trials, in terms of: the prescribed procedure for identification and release of varieties/hybrids in different zones and states. If it is through a committee, who are members and the chairperson. Is the same committee involved for transgenic? What is the ICAR policy for transgenic crops?</p>	<p>Based on two years yield and ancillary data in station trials, entry is nominated in IVT of AICRP-RM coordinated breeding trials where it is compared with National checks, Zonal checks and latest release zone wise/situation wise. Any entry which registers more than 10% seed yield/oil yield advantage over best check, is promoted for next stage of testing i.e. AVT-1, same criteria is followed in AVT-I for qualifying in AVT II. After 3 years evaluation, identification proposal is submitted to Varietal Identification Committee and entry is identified for release. In each year minimum three valid location data are required for promotion.</p> <p>Constitution of Variety Identification Committee:</p> <p>The Variety Identification Committee shall comprise the following</p> <ul style="list-style-type: none"> • DDG (CS) or his nominee* Chairman • Assistant Director General (Concerned Crop) Member • Assistant Director General (Seeds) Member • Project Director (DSR) Member • Director of Research of Host Institute/SAU Member • Agriculture Commissioner (Department of Agriculture) Member • One Director of Agriculture (State Government) Member • One representative of seed organization (NSC, SSC) Member • Representative of crop-based processing/manufacturing industry Member • One representative of the private seed agency Member • Two eminent scientists Member • Project Director/Project Coordinator* Member <p>*Essential members; a quorum of six members needs to be present</p>

		Regarding committee for transgenic, we cannot say that the same committee will be there. The policy for transgenic crop may be sought from ICAR head quarter.
ii	No. of trials that must be conducted before data can be accepted for agronomic evidence; the zones that must be completed etc. I require this for transgenic Mustard trials DMH 11. I also require the prescribed norms covering the selection of zonal and national checks of hybrids/varieties.	Minimum 3 valid location data are required for promotion of entry to next stage of testing in each zone. Therefore minimum 9 location data of 3 year are desirable for variety/hybrid release. Zonal and National checks of hybrids/varieties are decided on the basis of performance of a particular variety over the years to be used as zonal/National check is decided in Annual Group Meeting of Rapeseed-Mustard Research workers where full house of breeders are there.
iii	Were field trials of DMH 11 also conducted under All India Co-ordinated Research Programme of Rapeseed-mustard? If so, were they done under the same policy of testing in different stages, promotion, identification and release of varieties/hybrids? Or, is there a separate policy or guideline required by the ICAR for DMH 11/GMOs? If so please provide details there-of.	DMH 11 was evaluated at different AICRP centers as per the protocol provided by GEAC through DUSC. The evaluation of DMH 11 was done separately as per guidelines of GEAC which differs with AICRP policy. Regarding separate guidelines for transgenic evaluation, information may be sought from ICAR HQ.
iv	The GEAC approvals prescribe testing of GMOs across zones with an adequate number of locations. Why were DMH 11 field testing and evaluation required only in a few/inadequate number of location and in States where mustard has a limited area under cultivation?	Information may be sought from developers of the DMH 11 i.e. DUSC about permission. However, the agriculture is the state subject, the state does not give permission for field trials of transgenic. That's why the trial could be conducted in different years except only in those states where no much area under mustard is there and state permission might be taken.
2.	'COMPARATOR/S' VARIETY/HYBRID USED FOR DMH 11 & OTHER DATA FOR HYBRIDS/VARIETIES	

i	What is the yield/ mean performance of the 'Checks,' zonal and national Mustard varieties/hybrids in coordinated mustard trials used as the comparator/s for mustard DMH 11 for all the years available? How old are they and what was the reason for their selection?	See Annexure I Varuna was released in 1975 for mustard growing areas of the country. RL 1359 was released in 1987 for Zone II. Maya was released in 2002 for Zone III. The reason for keeping old check and not new hybrid check and National check variety may be asked to DUSC.
ii	DMH 11: what is the average yield for DMH 11 before and after factoring in the norms that must be followed in field trials? Please provide relevant tables.	Annexure II
iii	Has DMH 11 yield data been compared to the latest 'releases' of zonal and National Checks (coordinated trials) of hybrids/varieties? If not, why not? Please provide relevant data of the latest releases in coordinated trials of the last 5 years. Please provide data including mean data of the best performers of the last 5 years of hybrids and varieties released in Farmers' fields	The trial was initiated during 2005-06 with National checks and non- transgenic experimental hybrids which were later on changed during course of evaluation. Annexure III Annexure-IV
C	OTHER	
i	Has DMH 11 been tested with the mandatory 50 meter border where no crop is sown in accordance with the permission given by GEAC?	Other crops were there within 50 meter border. But mustard was not there while evaluating BRL-II during 2014-15.
ii	What is the average 1000 seed weight and oil yield of check and released varieties in last 5 years, zones wise? Please provide the comparative data for DMH 11. What is the farmer-preference and processors' preference in this matter and why.	Annexure V Farmer generally prefer bold seeded non shattering habit varieties
D	THE ROLE AND AUTHORITY OF THE DRMR IN TESTING TRANSGENIC MUSTARD	
i	Please clarify whether the DRMR has been/is responsible for the entire protocol of testing transgenic Mustard DMH 11 and is a decision-making authority in this matter.	No, DRMR is not a decision making body. Testing protocol was given by DUSC. DRMR is not the decision body as is being regulated. However, the trial location of AICRP was used for evaluation. DRMR has not conducted any trial and the data received by DU/NDDDB staff was passed to DRMR for onward transmission to DUSC/GEAC. Hence, no raw data of each location replication wise is not available with DRMR

		expect 2014-15.
ii	The claim of DrPental is that hybrids made with DMH 11 Barnase-Barstar will provide improved yields of 25-30% more than non-GMO hybrids/varieties of rapeseed-Mustard. Based on your analyses, is this true? Does DMH 11 perform better than non-GM mustard hybrids/Varieties? If not, why was DMH 11 allowed to progress to BRL II or pre-commercial field trials where the risk of contamination is so great?	It does not hold true while comparing the average performance of varieties/ hybrids in different trials under AICRP- R&M and FLD's Annexure-IV
iii	Has the DRMR provided any official communication/Report on its final views of the testing of DMH 11 to the ICAR? If so please provide a copy of the Report/Communication	No, DRMR has not provided any final comments on its testing.
E	BIO-SAFETY DOSSIER FOR DMH 11	
i	Who has carried out the Bio-safety and risk assessment of DMH 11?	Information may be sought from DUSC, New Delhi
ii	What is the capacity and expertise of the above entity to undertake this specialized work for DMH 11 specifically and GMOs?	Information may be sought from DUSC, New Delhi
iii	Is any other country involved in the preparation of the bio-safety-dossier for DMH 11. If so, please provide a copy of the letter of permission/authorization from the Bio-safety Board.	Information may be sought from DUSC, New Delhi

Annexure I

Mean seed yield (Kg/ha) of mustard check varieties used for promotion and identification of entries

ZONE-II				
Year	National Check (Kranti)	Zonal Check RL 1359	Latest Release Variety (kg/ha)	Annual Progress Report of ACRIP RM during different year
	Mean Yield (kg/ha), Locations, Range	variety Mean Yield (kg/ha) Locations, Range		REFERENCE
2010-2011	2500 (7) 1567-3255	2294 (7) 1351-3288	NRCDR-2 (2537)1669-3197	2011-PB33
2011-2012	2444 (7)1666-2959	2619 (7) 1475-3530	NRCDR-2 (2421)1573-3031	2012-PB31
2012-2013	2349 (7) 1541-3814	2398 (7)1399-3688	NRCDR-2 (2265)1289-3247	2013-PB41
2013-2014	2385 (6)1552-3182	2497 (6)1720-3158	RH-749 (2611)1626-3933	2014-PB51
2014-2015	2165 (6) 1710-2643	2285 (6)1639-2901	DRMRIJ 31 (2477)1681-3390	2015-PB47
Av. seed yield (kg/ha) of Checks	2374(33)	2420 (33)	NRCDR-2 2407 (21)	
			RH-749 2611 (6)	
			DRMRIJ-31 2477 (6)	

ZONE-III				
Year	National Check (Kranti)	Zonal Check Maya	Latest Release Variety (kg/ha)	Annual Progress Report of ACRIP RM during different year
	Mean Yield (kg/ha), Locations, Range	variety Mean Yield (kg/ha) Locations, Range		REFERENCE
2010-2011	2137(6)1398-3111	2011(6)1481-2623	RGN-73(2367)1838-4000	2011-PB35
2011-2012	1842(5)1100-2282	1709(5)917-2049	RGN-73(1875)1529-2519	2012-PB33
2012-2013	1632(6)1444-1878	1597(6)1239-1826	RGN-73(1710)1292-2056	2013-PB43
2013-2014	1620(4)1108-2419	1952(4)1425-2788	RGN-73(1703)1448-2223	2014-PB53
2014-2015	1941(4)1572-2617	1974(4)1547-2597	RGN-73(2082)1600-2419	2015-PB49
Avg. seed yield (kg/ha) of Checks	1842 (25)	1836 (25)	RGN-73 -1959(25)	

Figures in parenthesis indicates number of locations

Annexure II

Mean seed yield of DMH 11 during different years of evaluation

S.No	Entry	Seed yield (Kg/ha)			
		2006-07	2010-11	2011-12	2014-15
1.	DMH-11	1550 (10)*	2600 (3)	3024 (2)**	2385 (3)

The average seed yield of 18 locations of DMH 11 is 2028 (Kg/ha)

Figures in parenthesis indicates number of location

** Inadequate number of locations

If we exclude the data of inadequate number of location during (2011-12) as is being followed in ACRIprm the average yield of DMH 11 will be 1903 (kg/ha) of 16 locations during 2006-2007,2010-11 & 2014-15. In ACRIp if only two locations data is there than we do repeat the trial for next year with sufficient number of locations.

Yield performance of the transgenic hybrid DMH-11 in large scale trials (2006-07)

Location	varuna	DMH-1	Kranti	DMH-11	Zonal check
Delhi	1395	1884	1503	1748	1313
Bharatpur (Kumhare)	565	1098	940	923	1003
Kanpur	1168	1110	1380	1319	1577
Pantnagar	952	1666	1232	1311	1208
Navgaon	1111	1434	1097	1264	1002
Sriganganagr	1527	1501	1606	1370	1344
Kota	2466	2488	2433	2325	2368
Gwalior	592	1289	880	1347	755
Hisar	771	1302	889	1553	740
S.K.Nagar	1690	1975	2272	2349	2295
Overall Mean	1224	1575	1423	1550	1360

Strain	Seed yield (kg/ha)		increase (%) over checks			Mean
	Range	Mean	Varuna	Kranti	Zonal check	
Varuna	565-2466	1224	-	(-13.9)	(-10.0_	-
DMH-1	1098-2488	1575	28.6	10.7	15.7	18.3
Kranti	880-2433	1423	16.2	-	4.6	-
DMH-11	923-2349	1550	26.6	9.0	13.97	-16.5
Zonal Check	755-2368	1360	11.1	-4.3	-	-

Seed Yield (Kg/Ha) of DMH-11 under Biosafety Tial-1 (BRL-1)

During Rabi 2010-11

S.No	Entry	ICAR Centre			Total	Mean
		Kumher	Alwar	Sgnagar		
1.	Varuna (barnase)	1986	1789	2513	6287	2096
2.	EH-2 (barstar)	1730	1842	2455	6026	2009
3.	Varuna	1866	1741	2670	6278	2093
4.	EH-2	1793	1716	2182	5691	1897
5.	DMH-11	2285	2515	3000	7801	2600
6.	Maya/RL-1359(ZC)	2057	1767	2287	6112	2037

Seed Yield (Kg/Ha) of DMH-11 under Biosafety Trial-1 (BRL-1)

During Rabi 2011-12

S.No	Entry	ICAR Center		Mean Seed Yield (KumherandAlwar)
		Kumher	Alwar	
1.	Varuna (barnase)	2484	2098	2291
2.	EH-2 (barstar)	1640	1581	1610
3.	Varuna	2375	2169	2272
4.	EH-2	1873	1608	1740
5.	DMH-11	2892	3157	3024
6.	Maya/RL-1359(ZC)	2195	1836	2015

Seed yield and other agronomic characteristics of transgenic mustard hybrid DMH-11 under BRL-II trial 2014-15

S.No	Entry	ICAR Center			Mean Seed Yield (Delhi, Bhatinda, Ludhiana)
		Delhi	Bhatinda	Ludhiana	
1.	Varuna (barnase)	1700	1947	1937	1861
2.	EH-2 (barstar)	1110	1562	2001	1557
3.	Varuna	1746	1910	2006	1887
4.	EH-2	953	1442	1739	1378
5.	DMH-11	1879	2734	2543	2385
6.	Mava/RL-	1571	1791	1965	1775

1359(ZC)				
----------	--	--	--	--

Annexure III

Mean seed yield of released varieties (Kg/ha)

Zone-II						Annual Progres Report of ACRIPRM during different years
	REFERENCE	Seed Yield (Kg/ha)	Location	Year of Evaluation	No. of Year	REFERENCE
New Released Variety	RH-749	2561	34	(2009-10 to 2014-15)	5	2010-PB33, 2011-PB40, 2012-PB-38, 2014-PB50, 2014-PB56, 2015-PB52
	DRMRIJ-31	2481	28	(2010-11 to 2014-15)	4	2011-PB33, 2012-PB38, 2013-PB46, 2015-PB47, 2015-PB52
	RH-406	2196	18	(2008-09 to 2014-15)	4	2009-PB42, 2010-PB44, 2011-PB44, 2015-PB54
	NRCDR-2	2382	27	(2009-10 to 2012-13)	4	2010-PB33, 2011-PB33, 2012-PB31, 2013-PB41
Avg. seed yield of hybrid entries		2342	26	(2010-11 to 2014-15)	5	2011-PB54, 2012-PB47, 2013-PB63, 2014-PB72, 2015-PB66
Avg. seed yield of hybrid checks		2482	26	(2010-11 to 2014-15)	5	2011-PB56, 2012-PB47, 2013-PB63, 2014-PB72, 2015-PB66
Zone-III						
Latest Release	RGN-73	1959	25	2010-11 to 2014-15	5	2011-PB35, 2012-PB33, 2013-PB43, 2014-PB53, 2015-PB49

Annexure IV

FLD yield data

Performance of improved varieties of Indian states in FLDs conducted in major states during 2010-11

State	Centre	Varieties Demonstrated	FLDs	Mean yield (kg /ha)		YIOFP (%)
				IP	FP	
RAJ	JDH (5) BHP (10) NAV (10) SGN (20)	NRCDR 2, Bio902, Ashirwad, Navgold, RGN73, RGN145, Laxmi, RGN48	45	2084	19181	8.7
HAR	HSR (10)	RH 30, RH 8812, RH 9304, RB 50	10	2269	2185	3.8
UP	KPR (5) VAR (16) BHU (8)	NRCDR 02, NRCHB 101, Ashirwad, Kanti	29	1868	1584	17.9
Annual Progress Report (2011). AICRP-RM. DRMR. Bharatpur (Raj.). Pp: FLD-9						

FLD stands for Farmers field Demonstrations based upon the plot size of 0.4ha or one acre

RAJ = Rajasthan; HAR= Haryana; UP= Utter Pradesh

JDH= Jodhpur; BHP= Bharatpur; NAV= Navgaon; HSR Hisar; KPR= Kanpur; VAR= Varanshi; BHU Banarash Hindu University (for Chandoli, Balia, Gazipur, Azamgarh Distrct)

Performance of improved varieties of Indian states in FLDs conducted in major states during 2011-12

State	Centre	Varieties Demonstrated	FLDs	Mean yield (kg /ha)		YIOFP (%)
				IP	FP	
RAJ	BHP (50) NAV (12) SGN (20)	NRCDR 2, NRCHB 101, RRN 505, Laxmi, RGN 73, RGN 48, RGN 145	82	2121	1918	10.6
HAR	HSR (12)	RH 30, RH 8812, RH 9304, RB 50, RH 0119, RH 0406	12	2368	2222	6.6
UP	VAR (19) AGR (20)	NRCDR 02, NRCHB 101, Ashirwad	39	1913	1727	10.8
Annual Progress Report (2012). AICRP-RM. DRMR. Bharatpur (Raj.). Pp: FLD-9						

AGR= Agra

Performance of improved varieties of Indian states in FLDs conducted in major states during 2012-13

State	Centre	Varieties Demonstrated	FLDs	Mean yield (kg /ha)		YIOFP (%)
				IP	FP	
RAJ	BPR (40) SGN (20)	NRCDR 2, NRCHB 101, RGN 73, RGN 48, RGN 229, RGN 236,	60	2113	1874	12.8
HAR	HSR (20) BAW (3)	RH 0749, RH 0406	23	2207	1970	12.0
UP	AGR (30) VAR (17) AMT (20)	NRCDR 02, NRCHB 101, Ashirwad	67	2230	1930	14.2
Annual Progress Report (2013). AICRP-RM. DRMR. Bharatpur (Raj.). Pp: FLD-8						

BAW= Bawal

Performance of improved varieties of Indian states in FLDs conducted in major states during 2013-14

State	Centre	Varieties Demonstrated	FLDs	Mean yield (kg /ha)		YIOFP (%)
				IP	FP	
RAJ	BHP (55) SGN (20)	NRCDR 2, NRCHB 101, RGN 73, RGN 229, RGN 236,	75	1907	1717	11.1
HAR	HSR (4) BAW (3)	RH 0749, RH 8812	7	2264	2016	12.3
UP	AGR (20) VAR (17) AMT (20)	NRCDR 02, NRCHB 101, Uravashi, Maya, Kranti, Ashirwad	57	1943	1648	17.9
Annual Progress Report (2014). AICRP-RM. DRMR. Bharatpur (Raj.). Pp: FLD-9						

AMT= Amity, NOIDA; SGN= Sriganganagar

Performance of improved varieties of Indian states in FLDs conducted in major states during 2014-15

State	Centre	Varieties Demonstrated	FLDs	Mean yield (kg /ha)		YIOFP (%)
				IP	FP	
RAJ	BHP (80) SGN (20)	RH 749, DRMRIJ 31, NRCDR 02, RGN 73, RGN 229, RGN 236, RGN 48, RGN 145	100	1800	1630	10.4
HAR	HSR (4) BAW (3)	RH 0749	7	2184	1882	16.0
UP	VAR (20) AMT (22)	RH 749, NRCDR 02, NRCHB 101, Maya, Kranti, Ashirwad	42	1860	1580	17.7
Annual Progress Report (2015). AICRP-RM. DRMR. Bharatpur (Raj.). Pp: FLD-9						

Annexure VI

1000 Seed weight and Oil content (%) latest releases, Checks and DMH 11

Zone II

Varieties/hybrids	1000 Seed weight (g)	Oil content (%)
RH 749	6.9	39.2
DRMRIJ 31	4.9	40.0
NRCDR2	5.2	40.1
DMH 1	3.9	39.9
NRCHB506	4.5	39.9
Coral 437	4.0	39.7
DMH 11	3.3	40.2

Zone III

Varieties/hybrids	1000 Seed weight (g)	Oil content (%)
RGN 73	4.1	40.1
Maya	4.4	39.0
DMH 1	3.8	40.2
NRCHB506	4.6	40.3

The additional queries are responded in Annexure VII

a. DMH field trials: Please specify sources of data/evaluation and or analyses under each table. Were these analyses signed off by the DRMR or not.

Data were recorded/analyzed by respective trial manager of AICRP centre/personals from DU/NDDDB where trial was conducted. Compiled data from all locations were submitted to DUSC/GEAC by DRMR

b. I find you have accepted or the GEAC has accepted just two locations for field data on DMH 11 in one instance. According to your guidelines, this is a contravention. So let me state that if this field trial pertained to one of the DRMR 'coordinated' trials for hybrids or varieties of rape-mustard, would you accept data from just 2 locations or not. If not, please provide the new mean yield figures for DMH 11

We have not accepted or rejected any data, however in ACRIP we do not consider two location data for any conclusion for advance stage of testing, in such cases we allow to repeat the trial with sufficient number of locations.

Revised mean excluding two locations has been corrected under the table of DMH 11

II. Point iii on pg. 2:

In what way do protocols of the DUSC and or the GEAC differ from the DRMR AICRP? Did the DRMR sign-on to these protocols (of the GEAC/DUSC) or approve them. For something this critical for the Nation, how is it that the DRMR, which is the center of authority of rape-seed mustard, is not involved in wither the critical analyses and evaluation?

We are not aware about the Transgenic protocol, however the criteria which are being followed in ACRIPRM for the evaluation, and promotion are placed below.

AICRP-RM criteria for promoting the strains

- The strain (variety/hybrid) outyielding the best check by margin of at least 10 percent either for seed yield or for oil yield shall be promoted for advanced stage of testing, however an exemption upto 10 kg for seed yield may be considered.
- The qualifying strains for possessing any specific trait like quality, drought, disease and pest resistance will be promoted even if its yield is at par with the best check.
- The qualifying trials for computing the mean seed yield should have CV less than 15% for trials conducted under irrigated and less than 20% for trials conducted under rainfed and alkaline and saline conditions.
- If the differences in seed yield of same genotype being used as filler/check are equal or greater than CD value, the data of the centre shall not considered.

- If the variation for seed yield among the strains of a trial is more than four times at one centre and not supported by similar trend at other centres of the zone, such data of that centre shall not be considered.
- The plant population should be at least 80% of the expected plant population.

Plant Population -Minimum Criteria

IVT	110
AVT	260

- The experimental mean seed yield should be equal to or greater than the state mean for the seed yield.
- 75% of state average yield during last 3 years shall be the criteria for inclusion of data on the basis of General Mean for late sown, Rainfed, Salinity and Taramira trials.
- In Salinity trials EC levels should be 10 or >10 dS/m for inclusion of the data.
- A margin of 5 days over the best check's maturity duration shall be given in early maturity toria/mustard trial.
- In toria/early mustard trial, promotion shall be based upon superiority over the earliest maturing check
- Non significant data shall not be considered for computation of mean.
- Expts with <5% C.V. shall not be considered for computation of mean
- Entries developed through pure line selection from germplasm/variety shall not be evaluated.

The then Director of DRMR and Developers of the transgenic hybrid DMH 11 signed a joint project proposal under which this transgenic hybrid was evaluated.

III. Did the DRMR provide its views in writing at any time on the evaluation of DMH 11 comparing yields to varieties and hybrids, especially latest releases. I ask this because based on mean yields including of the latest releases, DMH 11 is not a better performer. Therefore it should never have been tested as a GM mustard crop. This is the first stage of evaluating any GMO ie --- is the GMO required in the first place.

We do feel that the best are to be compared with best available latest varieties and hybrids, so that farmers may be benefitted by new variety/ hybrids. The data first two years of testing 2005-6 and 2006-7 clearly shows that DMH 11, and DHM1 are at par in seed yield.

IV. Finally – please be so kind as to provide full forms of the abbreviations/acronyms used in your reply under the tables so they are comprehensive to new-comers eg FLD =?

Needful has been done with FLD tables

Annexure VIII

Yield and oil content data of transgenic mustard hybrid trial from eight locations conducted during 2005-06.

Strains	Delhi		Bharatpur		Kanpur	Pantnagar	Navgaon	S.K.Nagar		Kota		Gwalior
	Yield (Kg/h)	Oil Content (%)	Yield (Kg/h)	Oil Content (%)	Yield (Kg/h)	Yield (Kg/h)	Yield (Kg/h)	Yield (Kg/h)	Oil Content (%)	Yield (Kg/h)	Oil Content (%)	Yield (Kg/h)
DMH-11	2415	39.4	1817	39.3	1294	1194	437	2673	38.9	1675	38.6	1104
DMH-1	2391	38.5	1710	41.5	1236	1182	516	2367	38.8	1636	38.7	1080
Varuna	1886	38.2	1441	40.2	1083	806	258	2049	36.7	1960	39.5	737
Kranti	1774	37.7	1851	42.6	1055	978	304	2088	38.6	1528	39.0	813
Local Check	1615	38.3	1879	38.9	1261	954	409	2598	39.8	1597	39.0	1033

ACRIPRM Report (2006) PB 25

**SEED YIELD (KG/HA) OF TRANSGENIC MUSTARD HYBRID TRIALS
CONDUCTED DURING 2006-07 UNDER THE SUPERVISION OF
NRCRM, BHARATPUR, ICAR**

Entry	Delhi	Bharatpur	Kanpur	Pantnagar	Navgaon	Sriganganagar	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

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

Mean Seed Yield of recently released, extensively evaluated Varieties/Hybrids

Zone II	Number of Years of Evaluation (Years)	Number of Locations	Mean Seed Yield (Kg/Ha)	% Difference with DMH-11
VARIETIES				
RH 749	5 (2009-10 to 2014-15)	34	2561	+26.2
DRMRIJ 31	4 (2010-11 to 2014-15)	28	2481	+22.3
NRCDR 2	9 (2003-04 to 2013-14)	85	2282	+ 12.5
HYBRIDS				
DMH-1	5 (2009-10 to 2014-15)	52	2586	+27.5
NRCHB 506	8 (2005-06 to 2014-15)	50	2241	+ 10.4
Coral 437	7 (2006-07 to 2010-11)	20	2542	+25.3
DMH-11 (Transgenic)	4 (2006-07, 2010-11, 2011-12, 2014-15)	18	2029	-

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 I	3.9	39.9
NRCHB 506	4.5	39.9
Coral 437	4.0	39.7
DMH II	3.3	40.2

AICRPRM- Reports