

Database and information retrieval system for soybean varieties of India

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ABSTRACT

A software package (VIS) on varietal Information for Soybean has been developed in MS-ACCESS 97. This package provides detailed information on 35 different morphological characters of all the released/notified varieties of soybean in India. The information is retrieved in the form of comparison tables, colorful pictures and reports in a quick, easy and efficient manner with minimal keyboard intervention as per different users' needs.

Keywords: information system; soybean; variety information; character information

INTRODUCTION

In India soybean ranks third in oilseeds after groundnut and rapeseed mustard. During the triennium ending 1999-2000, the area and production of soybean in the country was 6.093 million hectares and 6.415 million tonnes with a productivity level of 1053 kg/ha. In India Madhya Pradesh(M.P.) is the leading state in producing soybean followed by Maharashtra, Rajasthan and Uttar Pradesh.

Soybean is considered to be a most economical and valuable agricultural commodity as, it has good adaptability towards a wide range of soil and climate. On an average dry matter basis, soybean contains about 40% protein and 20% oil. With this composition, soybean ranks on the top in terms of protein content among all the food crops, and second with respect to oil content among all the food legumes (peanut has the highest oil content, which is about 48%). Soybean is very nutritious - the protein and oil components in soybean are not only in high quantity but also in high quality. Soy oils contains high proportion of unsaturated fatty acids, so it is a healthy oil. Soy protein contains all the essential amino acids, most of these amino acids are present in amounts that closely match those required for humans and animals. Also, soybean has functional health benefits. During the past several years there has been much interest among medical researchers in the potential role of soybeans and soy foods in preventing and treating chronic diseases. Soybean has versatile end uses. It has been used as a human food, animal feed, and industrial material.

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Looking to the manifold uses of soybean, with its high nutritive and medicinal value, its importance in cropping pattern, the efforts have been made to evolve suitable high yielding varieties with high oil content adaptable to different locations. In India, so far 75 varieties of Soybean were released for cultivation suitable for different states/areas throughout the country. Out of these, 32 varieties are in seed chain and every year new varieties are being added in this chain. Information on different aspects of these varieties like notification details, distinguishing morphological characters, area of adaptation, yield potential, resistance to different biotic and abiotic stresses are required by scientist, seed personnel, managers, administrators, extension personnel and farmers.

The varietal character information is mainly important to plant breeders for Identification of varieties, to farmers for selection of most suitable varieties for different farm conditions, to seed inspectors for choosing off-types, to researchers for choosing parents of a variety with desirable characters, to research planners for getting varietal information at a higher perspectives and to meet different purposes of different clientele.

Hence data regarding these characters need to be collated properly to create database to generate the information required by different end-users in an efficient manner.

In this digital era, with the advancement of the technologies, storage of large volume of information and accessing information at high speed has become effortless and affordable. Software helps to retrieve the right information at the right time at the right place for the right purpose. Software plays an indispensable role in enhancing the research activity by automizing the monotonous and tedious task, and the effort of the researcher could be diverted towards new creative initiatives in the new areas. These softwares also help to systematize the data for easy access and manipulation.

The need for digitalization of the varietal-character-data and rapid retrieval of varietal-character-information, necessitated developing a software viz varietal Information System (VIS). The system is designed to be very user-friendly with the use of different Graphical User Interface (GUI) tools. The user can give his choice for variety selection, character selection and comparison of varieties and characters and can get the required information in the form of comparison tables, color pictures and reports by using just a mouse with minimal keyboard operations.

DATA COLLECTION

Data was collected from the breeders of the respective varieties, variety release proposals and experiments conducted in replicated designs at the centre for 35 characters mentioned in Table 1.

DATABASE

Data collected for morphological characters are entered in main database table, VISTAB. The main database table has different fields for 35 characters. The S_NO and VARIETY_NAME fields have no duplicate values and therefore are used for unique identification of records. At present, the table has 75 records each for a specific soybean variety. Each record is a set of 35 fields and depicts one soybean variety with 35 characters as shown in Table 1.

Table 1

	CHARACTERS	FIELD NAME	DESCRIPTORS
1.	S.No.	S.NO	
2.	Variety Name	VAR_NAME	
3.	General Name	GEN_NAME	
4.	Year of release/identification	YR_RL	
5.	Status and year of Notification	STYR_NOT	
6.	Pedigree	PDG	
7.	Released by state/centre	RELCS	
8.	Area of adaptation	AR_AD	
9.	Hypocotyl : Anthocyanin coloration	HYPO	1=green, 9=violet
10.	Plant : Growth Type	P_GR	1=determinate, 2=semi determinate, 3=semideterminate to indeterminate, 4=indeterminate
11.	Plant : Color of Hair of Main Stem	P_COL_HR	1=grey, 2=tawny
12.	Plant : Height	PH	3=short, 4=short to medium, 5=medium, 6=medium to tall, 7=tall
13.	Leaf : Shape of Lateral Leaflet	LFS	1=lanceolate, 2=triangular, 3=pointed ovate, 4=rounded ovate
14.	Leaf : Intensity of Green Color	LFC	3=light, 5=medium, 7=dark
15.	Flower : Color	FC	1=white, 2=violet
16.	Pod : Intensity of Brown Color	POC	3=light, 5=medium, 7=dark
17.	Seed : Size	S_SZ	3=small, 5=medium, 7=large
18.	Seed : Shape	S_SH	1=spherical, 2=spherical flattened, 3=elongated, 4=elongated flattened
19.	Seed : Ground Color of Testa	S_GCT	1=yellow, 2=yellow green, 3=green, 4=light brown, 5=medium brown, 6=dark brown, 7=black
20.	Seed : Hilum Color	S_HC	1=grey, 2=yellow, 3=light brown, 4=dark brown, 5=imperfect black, 6=black
21.	Plant : Time of Beginning of Flowering	P_TOF	1=very early, 2=very early to early, 3=early, 4=early to medium, 5=medium, 6=medium to late, 7=late, 8=late to very late, 9=very late
22.	Plant : Time of Maturity	P_TOM	1=very early, 2=very early to early, 3=early, 4=early to medium, 5=medium, 6=medium to late, 7=late, 8=late to very late, 9=very late
23.	No. of Pods Per Plant	PPL1, PPL2	
24.	No. of Seeds Per Pod	SPP1, SPP2	
25.	Weight of 100 seeds (g)	SW	
26.	Seed : Coat Luster	S_CL	3=shiny, 5=intermediate, 7=dull
27.	Yield Potential (Q/ha)	YPL	
28.	Biomass (Q/ha)	BM	
29.	Harvest Index	HI	
30.	Oil Content (%)	OC1, OC2	
31.	Protein Content (%)	PC1, PC2	
32.	Bottom Pod Height	BPH	
33.	Lodging Score	LS	
34.	Field Weathering (%)	FW1, FW2	
35.	Reaction to Insects and Diseases	REA_INS_DIS	

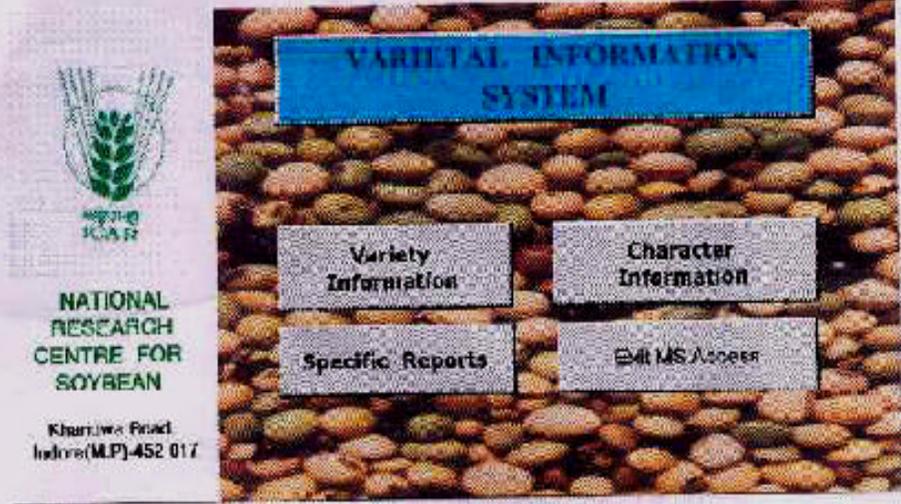


Fig. 1

Collect Variety Name		Clear	PHOTO
Variety Name	JS 72 200	General Name	Durga
Year of Release	1981	Area of Adaptation	Central Zone esp. M.P. (Madhya)
Status and Year of Registration	S.O. 19 (E) dt. 14/1/82		
Seedling	EC 14457 x Durg		
Released by State/Center	State	Hypocotyl - Archaean coloration	green
Plant Growth Type	Determinate	No. of Pods per Plant	50 To 65
Node/Color of Hair of Main Stem	Tawny	No. of Seeds per Pod	2 To 2
Plant Height		Weight of 100 Seeds (g)	12 To 14
Leaf Shape of Lateral Leaflet	Pair of ovate	Seed - Coat Lustrous	Intermediate
Leaf Intensity of Green Color	Light	Yield Potential (q/ha)	20 To 22
Flower Color	White	Biomass (q/ha)	73.14
Pod - Intensity of Brown Color	Medium	Harvest Index	0.25
Seed Size	Medium	Oil Content (%)	To
Seed - Shape	Spherical Flattened	Protein Content (%)	To
Seed Ground Color of Testa	Yellow	Bottom Pod Height	
Seed Hilum Color	Black	Lodging Score	4
Plant Time of Beginning of Flowering		Field Weathering (%)	To
Reaction to Insects and Diseases	Tolerant to bacterial pustules		

Fig. 2

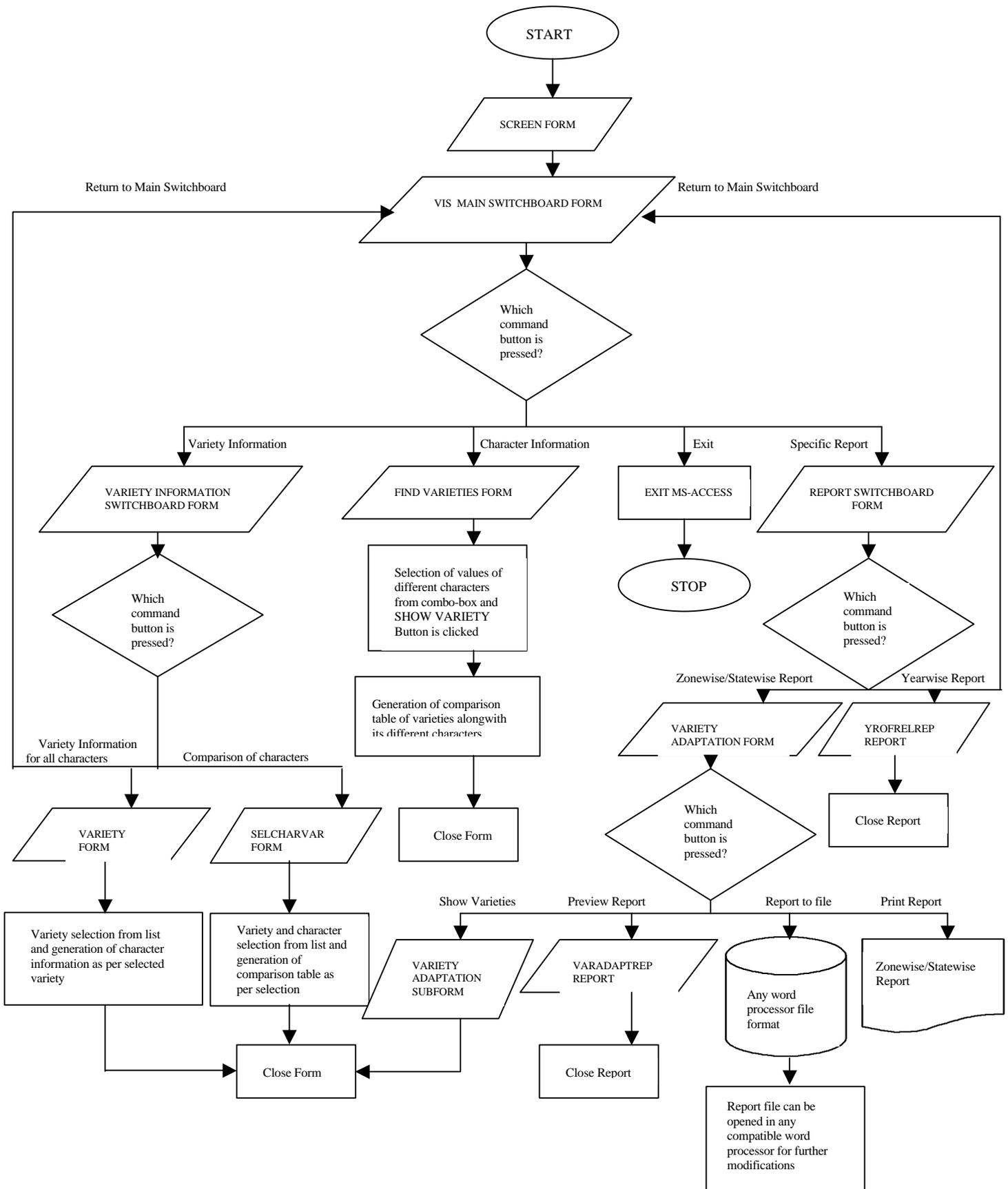


Fig. 3. Varietal Information System (VIS) flow-chart

VARIETAL INFORMATION SYSTEM (VIS)

The VIS is developed in MS-ACCESS as it provides a very good RDBMS tool for efficient management of database. It also has provision of versatile Graphical User Interface (GUI) tools for making efficient interactive information system. The package can be implemented on any PENTIUM computer with WINDOWS - 9X or compatible platform having MS-ACCESS. The system is designed to be very user-friendly and is completely mouse-driven. The GUI is made more attractive and user-friendly with the help of list-box, combo-box, text box, command buttons, icons, embedded colored pictures etc.

The VIS main user-interface is provided through VIS MAIN SWITCHBOARD FORM as shown in fig 1. It has following four command buttons which when pressed by a mouse click will perform certain function.

1. Variety Information - when pressed will generate VARIETY INFORMATION SWITCHBOARD FORM. This form has following command buttons.
 - Variety information for all characters - when pressed will generate VARIETY FORM. This form has a list-box containing list of all varieties. The user can select either ALL option or name of a particular variety from this list and get the character information for all 35 characters as shown in fig. 2
 - Comparison of characters - when pressed will generate SELCHARVAR FORM with a list of all varieties and characters. The user can select different varieties and characters of his choice by clicking mouse button in front of it and can get the comparison table of selected characters for the chosen varieties by pressing OK button.
 - Return to main switchboard - used to go to VIS MAIN SWITHCBOARD FORM.
2. Character Information - when pressed will generate FIND VARIETIES FORM with different characters and combo-box in front of it containing different descriptors/values for that character. The user can select specific values for different characters and get the list of varieties alongwith its characters by pressing SHOW VARIETIES button on the form. This form can be used for DUS(Distinctness Uniformity Stability) testing of newly released varieties as it contains all the asterisks characters of UPOV table of characteristics which are used for this test.
3. Specific Reports - when pressed will generate REPORT SWITCHBOARD FORM. This form has following command buttons
 - Zonewise/Statewise Report - when pressed will generate VARIETY ADAPTATION FORM with a list-box containing list of different agroclimatic zones and different states of Indian continent. The user can select a particular zone or a state and can get the varietal -character information as per his choice either in the form of a comparison table or a report. The user has a choice for the report to print or to see print preview or to store it to user-defined file that can be modified afterwards by opening it in any compatible word processor.
 - Yearwise Report - when pressed will give the report containing variety-list in the order of its year of release.
 - Return to main switchboard - used to go to VIS MAIN SWITHBOARD FORM.

4. Exit MS-ACCESS - is used to exit MS-ACCESS and control will come to main WINDOWS environment.

PHOTO Icon is used on the form when required as shown in fig. 2. The user can see the related colour photographs by clicking this Icon as and when required.

The complete functioning of VIS is depicted in the flow-chart as shown in fig. 3.

CONCLUSION

The system is successfully implemented at the centre and found to be very informative for different clientele. Its features like on-line help; attractive and user-friendly GUI and accurate, rapid retrieval of information in the form of comparison tables, reports and colour photos are highly appreciated.

As the system is developed in parlance with UPOV table of characteristics so it can be used as a ready reckoner for morphological characters of Indian soybean varieties. It provides detailed information on 35 different characters (including asterisks characters of UPOV guidelines) for all the varieties of soybean in India and will prove useful to meet the emerging needs of new Plant Variety Protection (PVP) regime. It has provision for expansion to include more characters and varieties that may be released in future. The package can be refined to cater to the requirements for implementation of DUS (Distinctness Uniformity and Stability) testing for varieties. To start with, it is developed as a stand-alone system, efforts are being in the process to make the system INTERNET-based so that the information can be made available on-line to users at different locations .

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