# OPTRACKS 3.0: A WEB-BASED OIL PALM TISSUE CULTURE DATABASE SYSTEM

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he oil palm tissue culture (OPTC) process involves many stages that generate enormous amount of information starting from sampling of ortets, culturing of explants, polyembryoids, calli, embryoids, shoots, transplanted ramets and planting in fields. Every OPTC laboratory has its own way of collecting data, from the conventional manual entry into forms, spreadsheets and/or databases etc. In MPOB, a relational database management system simply known as the Tissue Culture Database System (TCDS) was used since 2000 on a standalone personal computer (Zamzuri, 2001). As it does not require programming skills, the tissue culture (TC) team customised the design of more than 30 database tables covering the whole TC stages and sub-stages. TCDS enabled related records from across different groups of data to be linked, of which desired information can be retrieved and subsequently printed in any form for reporting purposes. The real power of a database is the ability to visualise data in as many ways possible through the use of query. In fact, the ability to perform queries is the key reason for using a database management programme to manage large amounts of related data, rather than being limited by spreadsheets or word processing softwares. Queries allow questions to be asked about the data and required information extracted from tables whilst providing the freedom to update the selected data in various ways. As the databases grew in size the system suffered from speed performance issues. This then triggered the migration to a MS SQL Server. This move simplified things further as it was easy to place a database on a client-server architecture and have multiple users share and update data without overwriting each other's inputs (Tarmizi et al., 2003).

#### PROBLEMS

Despite the first generation TCDS performing well especially for users without programming



Figure 1. OPTRACKS 3.0 opening screen.

skills, its limited memory space, sluggish speed and single user system were the main drawbacks as data input kept growing. Then the second generation upgrades were introduced via a clientserver system, also known as OPTRACKS 1.0 and 2.0, which accommodated more users and memory space but resulted in dependency on the vendor or a programmer. This latter issue certainly would incur more cost and time taken for modifications or additions to be incorporated into database tables and query or report formats.

### **OBJECTIVE**

To develop and manage the oil palm tissue culture database via a web-based architecture system that can be accessed and mined regardless of place, time and programming skills.

#### **BENEFITS**

- Collect, manage and access information via a web-based system at all times anywhere (authorised personnel only).
- Monitor production or research progress anywhere and at anytime through result analyses.
- Quick check on information for errors.
- Perform advance queries and generate customised reports even on the fly by non-programmers.







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Figure 2. A database table.

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## **OPTRACKS 3.0**

#### **Opening Screen**

OPTRACKS 3.0 was installed at an existing server hosted by the Breeding Group (ABBC). Via a web address, the following screen will display as in *Figure 1*. Only authorised personnel are allowed to open, key-in or edit and use the system.

#### **Database Table Screen**

Upon entering the database, a list of TC stages on the left side of the screen will appear (indicated by an arrow). By selecting one of them, a spreadsheet-like screen with rows and columns will be displayed. The 'row' represents a particular record while the 'column' represents a field name or variable. Each record in a table contains information about an individual item such as a specific TC stage. The records are made up of fields (displayed as columns), such as sampling no., date of culture, operator code and *etc.* (*Figure 2*). Entering new data is made-easy with a guided filling procedure via a bootstrap mode (*Figure 3*).

#### **Converting Data into Different File Formats**

By clicking the Excel button on the top left of the screen, data can be converted for either analyses or simple reporting as in *Figure 4*. This format can then be converted into MS Access file for advance query across several database tables as in *Figures 5* and *6*.

#### **Generating Data Report**

Creating a report is an effective way to present data as a printed document. Reports give

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		762	63845	03/01/2	017	126	U432	U432-1	QE1	5-1	NULL	1/U432-1	2	643-644	1/U432-	-1-70	QB38	PD	C10063845	
		763	63846	03/01/2	017	126	U432	U432-1	QE1	5-2	NULL	1/U432-1	4	645-648	1/U432-	-1-71	QB38	PD	C10063846	
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		765	63849	03/01/2	017	126	U432	U432-1	QE1	7-1	NULL	1/U432-1	2	652-653	1/0432	-1-74	Q838	PD	C10063849	
		766	63850	03/01/2	017	126	U432	U432-1	QE1	7-2	NULL	1/U432-1	2	654-655	1/0432	-1-75	QB38	PD	C10063850	
		767	63851	03/01/2	017	126	U432	U432-1	QE1	8-2	NULL	1/0432-1	6	656-661	1/0432	-1-76	QB38	PD	C10063851	
		768	63852	03/01/2	017	126	U432	U432-1	QE1	9-2	NULL	1/U432-1	18	662-679	1/0432	-1-77	QB38	PD	C10063852	
		769	63853	03/01/2	017	126	U432	U432-1	QE1	10-1	NULL	1/U432-1	2	680-681	1/U432	-1-78	QB38	PD	C10063853	
		770	63854	03/01/2	017	126	U432	U432-1	TE1	4-1	NULL	1/U432-1	12	682-693	1/U432	-1-79	TC1	PD	C10063854	
		771	63855	03/01/2	017	126	U432	U432-1	TE1	4-2	NULL	1/U432-1	2	694-695	1/U432-	-1-80	TC1	PD	C10063855	
		772	63856	03/01/2	017	126	U432	U432-1	TE1	5-1	NULL	1/U432-1	9	696-704	1/U432-	-1-81	TC1	PD	C10063856	
		773	63857	03/01/2	1017	126	U432	U432-1	TE1	5-2	NULL	1/U432-1	2	705-706	1/U432-	-1-82	TC1	PD	C10063857	
	-	774	63858	03/01/2	017	126	U432	U432-1	TE1	6-1	NULL	1/U432-1	29	707-735	1/U432-	-1-83	TC1	PD	C10063858	
	-	775	63859	03/01/2	017	126	U432	U432-1	TE1	6-2	NULL	1/U432-1	6	736-741	1/U432-	-1-84	TC1	PD	C10063859	
		776	63860	03/01/2	017	126	U432	U432-1	TE1	7-1	NULL	1/U432-1	28	742-769	1/U432-	-1-85	TC1	PD	C10063860	
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		778	63862	03/01/2	017	126	U432	U432-1	TE1	8-1	NULL	1/U432-1	2	778-779	1/0432	-1-87	TC1	PD	C10063862	
		779	63863	03/01/2	017	126	U432	U432-1	TE1	8-2	NULL	1/0432-1	14	780-793	1/0432	-1-88	TC1	PD	C10063863	
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		782	63866	03/01/2	017	126	U432	U432-1	TE1	10-1	NULL	1/U432-1	14	868-881	1/U432	-1-91	TC1	PD	C10063866	
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Figure 4. Converted data in Excel file.

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	11	12 013	UKM	00/31	24/04/2000	61/05/2000	UKM 0.231/992	NULL		NULL	NULL	NULL	*	NULL	NULL
	12	13 /6	UKM	60/09	05/04/2000	12/04/2000	UKM 0.235/267	NULL	-	NULL	NULL	NULL		NULL	NUL
	13	54 US2	ULP	00/33	08/05/2000	09/05/3000	ULP-0.189/168	NULL	4	L280-1	L280	290	*	NULL	NULL
	14	13 053	UUP	00/13	06/05/2000	09/05/2000	ULP-0.189/189	NULL		NULL	NULL	NULL		NULL	NULL
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	24	26 513	LD	00/25	27/06/2000	28/06/2000	LD-0.291/583	NULL	4	L305-1	L305	365	P	NULL	NULL
	25	27 83	KUU	00/24	16/05/2000	38/05/2000	KUU-0.211/1651	NULL	1	NULL	NULL	NULL	0	NULL	NULL
	26	28 016	UKM	00/26	21/06/2000	28/06/2000	UKM 0.231/963	NULL	1	NULL	NULL	NULL		NULL	NULL
	27	29 F7	UKM	00/20	07/06/2000	34/06/2000	UKM 0.235/209	NULL	1	NULL	NULL	NULL	P	NULL	NULL
	28	30 014	UKM	00/12	03/05/2000	30/05/3000	UKM-0.231/990	NUL	1	NULL.	NULL	NULL		NULL	NULL
	29	31 015	UKM	00/34	10/05/2000	17/05/2000	UKM 0.231/102	NULL	1	NULL.	NULL	NULL	P	NULL	NULL
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	81	23 U60	ULP	00/28	10/07/2000	11/07/2000	ULP-0.389/641	NURL	1	1322-1	L322	32.2	BOX	NULL	NULL
	82	34 017	UKM	00/30	26/03/2000	82/08/2900	UKM 0.231/113	NULL	1	NULL	NULL	NULL		NULL	NULL
	33	35 515	LD	00/31	26/03/2000	27/03/2000	LD-0.291/300	532	4	1306-1	L306	306	9	NULL	NULL
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Figure 5. Converted into Access file.

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Figure 6. Query across two tables.

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	27-Aug-01	1255-1/417-2/10	15	111	110	0.99	1	FL.	SP	12551417-211	11	15
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	02-Aug-01	1272-1/1537-1/3	23	n	32	2.91	1	FL.	SPN	L272-1/153T-1/4	4	0
	02-Aug-01	1272-1/1547-1/3	23	7	19	271	1	FL.	SPN	L272-1/154T-1/4	4	0

Figure 7. Customised report.

more control over how the data is displayed and greater flexibility in presenting summary information. Reports are also an efficient way to print information that is used regularly. Firstly, a template for report is designed and saved and will be used for generation of future reports. *Figure 7* shows a monthly report of polyembryoid cultures with calculated values of certain variables.

#### CONCLUSION

OPTRACKS 3.0 is useful in organising and managing OPTC data even by personnel with non-programming skills through a web-based platform. This is to cater to the dynamism and advancements in both research and production aspects of OPTC. It will be useful for future integration with other databases, data tracking and data mining systems in oil palm research.

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