



## research update



### investing in the future

Welcome to the first PBS International Research Update, a periodic publication to share research relating to issues around pollination control.

By acting as the interface between plant science and nonwoven technology we aim to deliver to our customers economic gains and superior genetic results. This update reveals some of the research that goes into our products.

Comprehensive understanding of how our pollination bags benefit our customers, exceptional customer care and innovation in all areas of our business are our guiding principles. We hope you enjoy the read!

#### get in touch

To share your thoughts on any of the research in this update or suggest ideas for future research contact us at [support@pbsinternational.com](mailto:support@pbsinternational.com)

### key findings

PBS pollination bags achieve higher % fruit set and greater genetic integrity than other bags ✓

Controlled studies show excellent performance in a new, trial formulation of **duraweb™** ✓

Seed producers who used PBS bags exclusively to control pollination charged 17% more for their seeds ✓

**duraweb™** transmits up to 8 times more light than Tyvek-style bags ✓

## continuous improvement in our materials



As part of our commitment to continuous improvement, we take the initiative to develop new formulations of our materials if we feel that we can improve performance or reduce costs. Mindful of recent increases in raw material costs, we have designed a new formulation of **duraweb™** and a new UV stable window material. We sought the same strength and performance but with greater protection against cost increases.

### Method

We never release a new material without extensive field trials, so we asked two leading Indonesian seed producers to test the material alongside the existing product in a 2x2 matrix. These customers didn't know which materials were which.

UV Stable Window	Existing Trial	duraweb™	
		Existing	Trial Material
		"Condition A"	"Condition B"
		"Condition C"	"Condition D"

Methods of evaluation included laboratory evaluation of pollen penetration and field testing.



"I have used PBS pollination bags for many years. In my opinion it would be very foolish to use anything else. The risk to the purity of the seeds and hidden additional costs to the production process would make it a costly error"

### Results

The users could hardly distinguish between the materials and no differences were identified in the performance of the materials\*.

Results	User Ratings	Blank Pollination	Seeds per Bunch	Pollen Penetration
SumBio	No sig difference	No sig difference	No sig difference	Not tested
Socfin	Not tested	No sig difference	No sig difference	No sig difference

\*5% level of significance

### Conclusions

We and our partners in this trial are satisfied the new materials meet PBS' stringent quality standards. We will expand production of the new formulation materials and will start to make them available over the coming year.

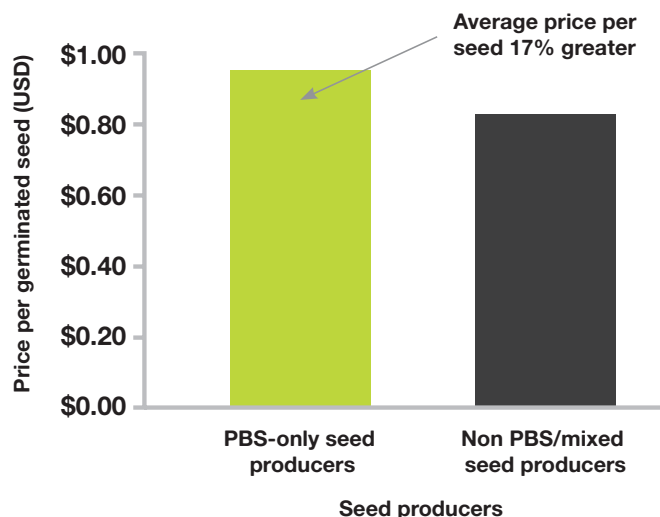
## makes sound economic sense

In 2009, MPOB presented some data including the price per germinated seed, from 9 major Indonesian Oil Palm seed producers.

The list included companies that at that time exclusively used PBS International bags to control pollination, and companies that did not.

The value of seeds relates to the quality of the palm expected to grow from it (eg oil yield, disease resistance). It also relates to the genetic integrity of that seed. For instance a high level of dura contamination makes the seed less valuable to customers.

The data suggests that PBS customers were able to charge more per seed, suggesting the market recognises the investment in high quality pollination control and is willing to pay a significant premium.



"We have used PBS bags exclusively for many years. Our customers understand that our seeds are the best possible quality because we get less contamination than using other bag types. This is good for our business, our reputation, and our customers."

**Mr. Tan Cheng Chua, AAR**

- Seed producers who exclusively used PBS bags for pollination control charged an average 17% more per seed
- This translates into nearly \$130 extra revenue per bunch for PBS customers, assuming a (low) estimate of 750 germinated seeds per bunch

## Pollination bag choice impacts % seed set and contamination rates

Anecdotally it is clear that choice of pollination bag affects results in oil palm seed production. To evaluate this we asked NBPOL's Dami Research Station to conduct an independent field trial to compare three types of pollination bag side by side.

### Method

The trial compared canvas pollination bags, Tyvek-style pollination bags, and PBS **duraweb™** bags (n=320). The test was carried out in field conditions following standard procedures for isolation of the female inflorescence.

### Results

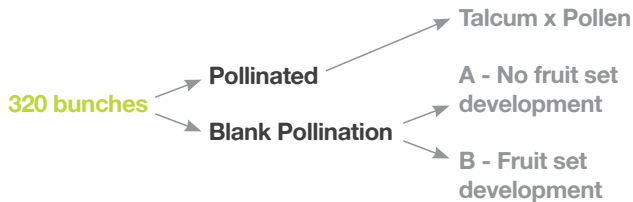
Results	Intactness	Insects	Water
Canvas	X	X	X
Tyvek-style	X	✓	X
PBS <b>duraweb™</b>	✓	✓	✓



**Intactness** - A tendency to distort or sag onto the inflorescence

Affects inflorescence development and pollen dispersal

PBS bags outperformed both alternatives and did not sag even in wind and rain. This effect was observed even when the tops of all bags were tied to adjacent fronds



**Insects** - Observed presence of insects, penetrating via stitches or holes

Affects genetic integrity and dura contamination rates; typically causes the bunch to be discarded

Weevils penetrated the stitching of some of the canvas bags



**Water** - Tendency to absorb or accumulate water within the bag

Affects pollen dispersal and the health of the inflorescence. Removing water adds labour and increases contamination risk

PBS bags outperformed both alternatives. 12% of the less breathable Tyvek-style bags accumulated significant volumes of water, averaging 4 litres of water each.

### Conclusions

#### the head of research's conclusions

"We conducted a short-term trial comparing alternative sources of pollination bags for oil palm control pollination, and found PBS bags to be the superior. The bags effectively ensured seed purity with no insect being able to penetrate or contaminate. In addition, they do not collapse onto the inflorescences or collect water. This helps us maximize seed production and also allow us to produce the best quality oil palm seeds worldwide. Using PBS bags has contributed to our international reputation for seed quality, which has helped our business grow."

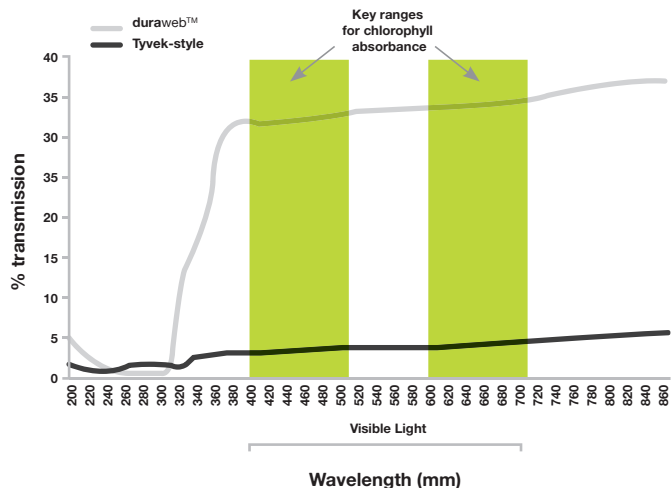
**Chris Lee, Head of Research, NBPOL**

## light transmission

Light in the visible spectrum is fundamental for plant health. Any covering of the plant – including by a pollination bag – affects this.

An independent materials engineering consultancy tested the proportion of light transmitted at different frequencies, comparing **duraweb™** to a Tyvek-style bag.

The difference is clear!





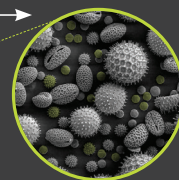
# our materials

**duraweb™** technology is strong against abrasion and tearing

Sunlight can pass through material - UV stable

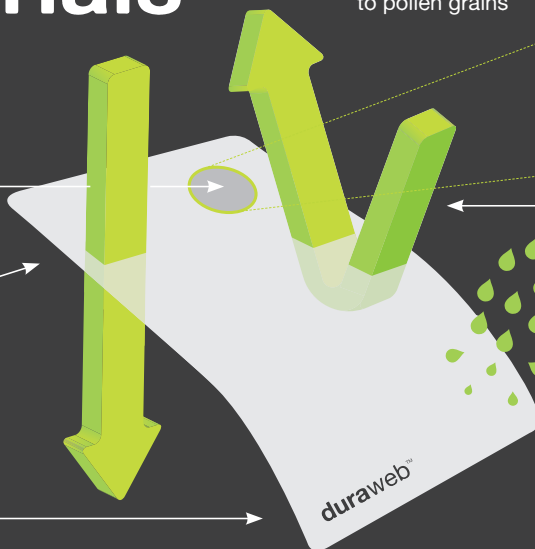
Flexible and foldable

Highly effective barrier to pollen grains



Moisture and air can pass through

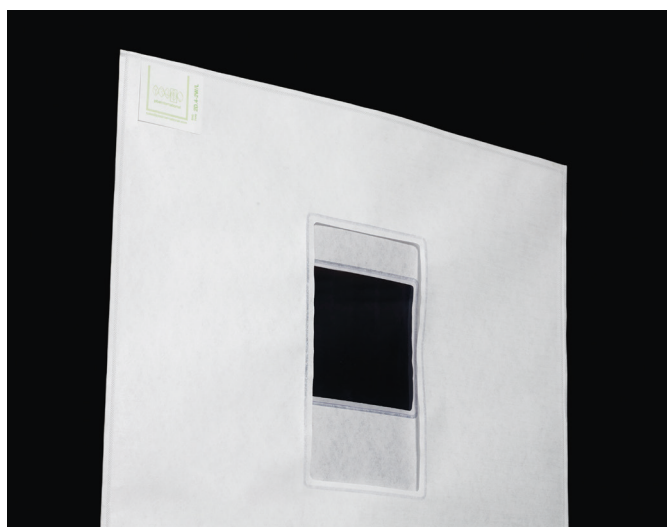
Rain doesn't affect **duraweb™** properties



## why our bags are best for oil palm

**duraweb™**, the unique material that our products are made from, is durable enough to resist tearing or damage by hard spiky plants and flexible enough to tie tightly, preventing entry by weevils. Our bags do not collapse onto the inflorescence when wet, and because they are breathable water does not accumulate inside causing inflorescence abortion.

**Our bags are economical in use because they maximise seed yields and minimise the risk of unwanted pollen contamination.**



## don't risk your reputation

**Don't gamble with inferior products. Here's why our customers trust our bags:**

- Halts unwanted pollen ✓
- Maintains plant health ✓
- Best air flow ✓
- Superior weather resistance ✓
- Demonstrated yield improvements ✓
- Makes sound economic sense ✓

**duraweb™**

Bag type	Length (cm)*	Width (cm)*	Depth (cm)*	No. Windows	Window size (cm)
2D.3	75	51	n/a	1 or 2	15x15
2D.4	91.5	63.5	n/a	1 or 2	30 (l) x 15 (w) front 15 (l) x 15 (w) back
2D.5	100	75	n/a	2	30 (l) x 15 (w) front 15 (l) x 15 (w) back
S.PC	100 inc spout	51	n/a	1	15x15

\*External dimensions

For more information go to [www.pbsinternational.com](http://www.pbsinternational.com)  
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