

## **Performance Plants Inc. Biotechnology Backgrounder**

Performance Plants Inc. (PPI) is an elite Canadian plant biotechnology company. Based in Kingston, Ontario, with research facilities in Saskatoon, Saskatchewan, the company has developed and holds global patents for breakthrough gene technologies<sup>1</sup> that:

- enhance (15-25%) crop yields through drought resistance in species such as corn, canola and soybeans (YPT™)
- protect crops against heat stress (HEAT)
- enable plants to use available water more effectively (WET)
- improve biomass for bio-fuels crops (BET)
- enhance the enzyme conversion of biomass cell-wall sugars (ECT)

Performance Plants Inc. (PPI) uses Second Generation<sup>2</sup> biotechnological tools. Second Generation biotech utilizes a plant's own genes. They are turned 'up' or 'off' depending on the desired outcome. No extraneous or external genes from bacterial, viral or animal sources are ever transferred or used in creating a PPI genetic trait. PPI's modified genes are purely species-specific. In fact, for plants with many varieties, corn for example, PPI isolates the required genes from each individual variety.

PPI begins the genetic identification process by isolating individual genes in a widely-used lab plant called, *Arabidopsis*.

The same traits PPI identify as valuable in *Arabidopsis* are subsequently isolated within crop plants such as corn, soybeans, canola, turf grass, etc. Once identified, isolated and developed, PPI tests the genetically modified plants in lab growth chambers that emulate a wide variety and range of field conditions. When successful traits are identified, PPI's customers in the seed and agri-business sector assume responsibility under license for seed development, regulatory registration and manufacture.

### ***Yield Protection Technology™ (YPT™)***

The first genetic enhancement developed by PPI is Yield Protection Technology™ (YPT™). It is the company's lead product and will be

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<sup>1</sup> For more information on these technologies see PPI's bio-tech media backgrounder)

<sup>2</sup> The use of genetically enhanced seeds is already entrenched among the major agricultural nations. Genetic enhancements known as First Generation technologies were made widely available to farmers in 1996. Since then, use of that seed has doubled every year, with Canada, the US, Argentina, Brazil and China accounting for 97% of the acreage using these enhanced seed varieties.

commercially available in 2011. YPT™ provides a yield increase for crops such as canola, corn and soybeans by protecting against drought. The genetic enhancement enables plants to activate their natural defences against drought at an earlier stage. The stomata by which plants naturally lose water close earlier in the drought cycle and the plant maintains moisture longer. As a result, yield is substantively increased. In canola trials, YPT™ increased yield by 25%. That is more than double the yield enhancement of genetic enhancements from other organizations.

### ***Water Efficiency Technology (WET)***

PPI technology known as Water Efficiency Technology (WET) enables plants to increase the efficiency of their water use. It is the first genetic enhancement of its kind and it enables crops to be grown with as little as 75% of the water other crops would require to provide the same yield. Irrigation costs can be cut by 25% substantively reducing cost to farmers and, of equal or greater importance, stress on aquifers is reduced<sup>3</sup>.

### ***Heat Stress Technology (HEAT)***

Heat Stress Technology (HEAT) stabilizes yield under high temperature stress. Increased heat at critical stages in plant development (for example during mid-summer flowering) can cause 'seed abortion' reducing yield. In fact each degree above 30° Celsius causes a 15% loss in yield for corn and soybeans. In an era of global warming, HEAT technology has significant potential to protect global food supplies.

### ***Value Enhanced/Stress Tolerance™ (VEST™)***

Performance Plant's array of genetic enhancements can be combined or 'stacked' increasing plant protection and increasing yield under multiple circumstances. For example, WET technology enabling more effective plant use of water can be stacked with YPT™'s early-warning system for drought. The plant is not only drought resistant it is greatly more water efficient.

### ***Bio-mass Enhancing Technology (BET)***

PPI has developed a significant genetic enhancement known as Increased Biomass Technology (BET). This technology increases stem biomass by as much as 100% and leaf biomass by as much as six times. For plants intended for the creation of bio-fuels, BET has great potential. To create the so-called Green Revolution, plant developers greatly reduced biomass in favour of redirecting plant growth to seeds for human and animal consumption. The result was dramatic increase in food supply. However, to develop plants for bio-fuels, it's best to go in the opposite direction and increase the mass of the non-seed parts of the plant. It is those parts that will be used in making bio-fuels.

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<sup>3</sup> About 70% of the world's water supply from rain and aquifers is used annually for agriculture. That water is not being replaced by Nature as fast as it is being used by humanity. Aquifers are shrinking with potentially disastrous consequences. Preserving aquifers is of urgent and pressing importance.

***Efficient Conversion Trait (ECT)***

PPI's Efficient Conversion Trait (ECT) resolves the second half of the bio-fuels dilemma – making the plant's cell-wall sugars more easily converted to bio-fuel. It does little good to have substantive biomass if the potential bio-fuel is so locked inside the plant's cell walls that extracting it is not cost-efficient. Pre-treatment of biomass required to make cell wall sugars more accessible to enzymatic 'digestion' is cut by as much as 30% with the use of ECT.

BET and ECT combined make the economics of biomass for bio-fuel creation much more attractive.