

Superior insecticide solutions

Bio-Gen Technology (ASX:BGT) is an ASX-listed AgTech company specialising in novel insecticides derived from nature. The company is developing two compounds, Flavocide™ and Qcide™. The former is synthetically produced while the latter is natural, but both are based on a class of chemistry called beta-triketones. Research has shown that beta-triketones have unique Modes of Action (MoA) (in other words, mechanisms to attack insects), not present in any other insecticide classes on the market today. Although the broad market for insecticides is competitive, there is precedent for insecticides with new Modes of Action to have potential to rapidly gain a substantial share of the market.

Serving a pressing market need

BGT has identified five key markets that represent a total addressable market at over US\$31bn: Public Health, Grain Storage, Crop Protection, Animal Health, and Consumer Applications. The need for BGT's solutions in all these markets is driven by the impact that insects and pests can have on global food security and on public health threats due to vector borne diseases. These problems could easily get worse as the world's population increases, climate change worsens, and insects continue to develop resistance to existing solutions.

Making significant progress to commercialisation

While BGT is still at the development stage, it is engaged in several collaborations and research programs (including, programs with the US CDC and Clarke Mosquito Control) that have developed into commercial agreements and are providing further evidence of the superiority of the company's products. BGT aims to file for regulatory approval for Flavocide™ Active Ingredient at the end of CY25 with a regulatory approval target for mid-CY27. Thereafter, it intends to generate revenue via licensing fees, milestone payments, royalties through sales partners and from the supply of Flavocide™ and Qcide™ Active Ingredients.

Valuation range of 17.3c-22.7c per share

We have valued BGT at 17.3c per share in a base case scenario and at 22.7c per share in an optimistic (or bull) case scenario, equating to equity values of \$34.8m and \$45.8m, respectively. We foresee the company being re-rated to our target range if it can progress its products to commercialisation within the aforementioned timeframe. Please see p.21 for the key risks that may impact our investment thesis.

Share Price: A\$0.049

ASX: BGT

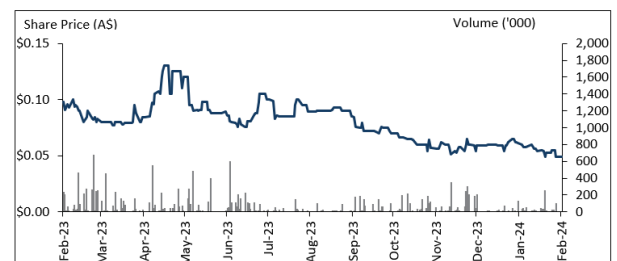
Sector: Materials

21 February 2024

Market cap. (A\$ m)	9.9
# shares outstanding (m)	201.4
# shares fully diluted (m)	210.2
Market cap ful. dil. (A\$ m)	10.3
Free float	100%
52-week high/low (A\$)	0.13 / 0.049
Avg. 12M daily volume ('1000)	63.2
Website	Bio-gene.com.au

Source: Company, Pitt Street Research

Share price (A\$) and avg. daily volume (k, r.h.s.)



Source: Refinitiv Eikon, Pitt Street Research

Valuation metrics	
DCF fair valuation range (A\$)	0.173-0.227
WACC	16.2%
Assumed terminal growth rate	None

Source: Pitt Street Research

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Bio-Gene is an AgTech company that is developing the next generation of novel insecticides.

Introducing Bio-Gene Technology (ASX:BGT)

Bio-Gene (ASX:BGT) is an AgTech company that is developing the next generation of novel insecticides. Insecticides are chemicals used to control insects by preventing them from engaging in undesirable or destructive behaviours. BGT has two key assets (in Flavocide™ and Qcide™) which were developed from a novel technology platform. Both are naturally occurring beta-triketones compounds. They work effectively in their own right, as well as in conjunction with other insecticidal agents, and offer unique benefits over existing solutions on the market today.

Flavocide™ and Qcide™

Flavocide™ is based on flavesone, a naturally occurring plant compound that can be synthetically produced via a proprietary process that allows production in large volumes for global demand. It could therefore be used for commercial purposes, for example, in public health and in grain protection.

The Insecticide Resistance Action Committee (IRAC) is an industry organisation that classifies insecticidal MoAs (Modes of Action). The MoA of flavesone has been shown to be different from any other insecticide classified by IRAC – and therefore one that specifically addresses insects' resistance to existing insecticidal products. The last significant MoA class which was introduced was the Diamides in 2008 that now represents a major segment of the global insecticide market.

Qcide™ is a natural oil product containing tasmanone as the major active component. The oil is extracted from the biomass of a rare cultivar of an Australian eucalypt, the Gympie Messmate, by utilizing a steam distillation process. Trees are currently being grown in a plantation farming system by sub-contractors in Far Northern Queensland. Qcide oil is targeted at the control of household and agricultural pests. The company has filed Plant Breeder's Rights (PBR) applications for high-tasmanone tree cultivars.

Qcide™ could be used in a variety of formulations and mixtures to suit a variety of pests and use patterns. For instance, it could be used as an aerosol for indoor insects, as an outdoor foliar spray mixture for fruit and vegetable pests or as an outdoor spray, hose-on or granular for the control of lawn pests.

Both assets have been tested via contract research, including by the University of Technology Sydney and Purdue University in the American state of Indiana. The testing confirmed the efficacy of both Qcide™ and Flavocide™ against a range of flying and crawling insects including flies and mosquitoes, as well as ticks.

BGT's assets are attracting interest

BGT is currently at the development phase but has established multiple commercial collaborations and Material Transfer Agreements. These include with:

- US-based company Clarke Mosquito Control,
- UK-based consumer products marketing company EverGreen Garden Care, and
- Israel-based plant protection company STK Bio-Ag Technologies.

Additional testing has been undertaken with not-for-profit research entities including Australia's GRDC (Grain Research and Development Corporation)



and CSIRO (Commonwealth Scientific and Industrial Research Organisation), as well as with the Center for Disease Control and Prevention (CDC) in the USA.

The results of all this testing have unanimously validated the effectiveness of BGT's assets. They also position the company well for commercialisation – several of the company's partnerships include commercial deals to take Flavocide™ and/or Qcide™ to market.

A significant need for new insecticide solutions exists

It is true that there are insecticide solutions available on the market today, in consumer, industrial and agricultural markets. However, this has not eradicated the problems that insects can cause – particularly in public health and agriculture – let alone prevented these problems from worsening. Problem insects in general are becoming more abundant due to climate change and are increasingly resistant to products currently on the market today. To illustrate with a couple of examples:

- 40% of the world's crops are lost to pests every year, equivalent to over 1.3bn tonnes of food; and
- Vector-borne diseases account for over 17% of all infectious diseases globally and cause over 700,000 deaths annually – the bulk of which are from malaria.

There is a compelling need for new insecticide solutions to come to market, that are more effective than today's solutions. And not just any new products, but those with new and unique Modes of Action that are not present in existing insecticides. The last time a significant new class of insecticides was commercialised occurred in 2008, when Japanese chemical producer Nihon Nohyaku commercialised the first Diamide product. This insecticide class rose to US\$1.5bn in global sales within five years and has maintained a double digit market share. Although BGT has some way to go before it can commercialise its products, this occurrence would again represent a new class of insecticides – there are no beta-triketone insecticides on the market today. It would not just be another Mortein spray¹, it would represent a completely unique new range of products with mechanisms not existing in the market today.

There is a compelling need for new insecticide solutions to come to market.

BGT has a US\$31bn Total Addressable Market

BGT is targeting five key markets that represent a Total Addressable Market (TAM) of over US\$31bn: Public Health, Grain Storage, Crop Protection, Animal Health, and Consumer Applications (Figure 1).

The largest of these is Crop Protection, that includes Grain Storage, which accounts for just over 52% of the market opportunity. Insects and pests can impact production of grain and crops and end-product quality. Grain and crops infested with or damaged by insects are essentially worthless in the end market. The problem is becoming increasingly accentuated because of insect resistance, but also because some insecticides can adversely impact beneficial insects such as bees and parasitic wasps that can be positive for crop production.

Public Health, Consumer Applications and Animal Health are also important markets because of the diseases that pests (particularly mosquitos) can cause to people and animals (both domestic pets and production livestock). Pest

BGT has a total of five key markets that represent a Total Addressable Market (TAM) of over US\$31bn.

¹ Mortein is an Australian brand of household insecticide owned by the UK company Reckitt Benckiser Group plc (LSE: RKT) – see mortein.com.au.



diseases are expected to become worse due to climate change, increasing urbanisation, the world's growing population and (again) the resistance of insects to existing solutions on the market.

Figure 1: BGT's five key markets



Source: Company

Bio-Gen's compounds offer promise to be more effective alternative insecticides, that can effectively protect against insects that have developed resistance to currently used insecticides, and that can avoid toxic impacts to the environment and to beneficial insects. The company has a clear path to market aided by several commercial partnerships that are supporting evaluation programs. Bio-Gen intends to file for regulatory approval by the end of CY25, with expected approval in the June quarter of CY27.

Nine key reasons to look at Bio-Gen

Insects cause significant problems in food production and public health.

- 1) **Bio-Gen is serving a market need that is significant and compelling.** Insects cause significant problems in food production and public health. It is estimated that 1.3bn tonnes of food are lost every year (40% of the world's crops) and 700,000 people perish due to vector-borne diseases. The problems caused by insects persist, despite the intensive use of these products on the market today given increasing resistance of insects to these products as well as a generally more favourable environment for insect pests.
- 2) **The markets for insecticides will continue to see demand grow.** The markets BGT is targeting are significant in terms of size (US\$31.1bn by BGT's estimates) but also due to the moral imperative to ensure food supply and health to a growing world population. The need for more effective insecticides will become more compelling due to increased insect populations due to climate change, the growing global population, and most importantly, the resistance of insects to insecticides that are on the market today. These will make the challenges to maintain food production and public health standards even more difficult in the absence of new solutions superior to current products.
- 3) **BGT has two key assets that are highly effective insecticides.** BGT's assets, Flavocide™ and Qcide™, are both compelling insecticides for a variety of reasons. Most particularly, both are highly effective assets in



Flavocide™ and Qcide have unique modes of action that are not replicated in any other classes of insecticides today.

their own right, as well as synergistic with some of the currently marketed products. They have unique modes of action that are *not replicated in any other classes insecticides today*. Most importantly, they control insects resistant to currently used insecticides.

- 4) **Significant testing has been, and continues to be, done on BGT's assets.** Both Flavocide™ and Qcide™ have undergone significant testing in conjunction with multiple industry leading companies, including with STK, Clarke and Evergreen. These partnerships have evolved into signed commercial arrangements.
- 5) **BGT has obtained significant patent protection for its assets.** These include coverage across multiple jurisdictions: Australia, New Zealand, the USA, Europe, Brazil, China, and South Africa. The company's patent families include the control of resistant pests (both generally and certain specific pests) as well as use in synergistic combinations.
- 6) **BGT has a key pathway and timeline to commercialisation.** BGT intends to commercialise its products, aiming to file for regulatory approval of the Flavocide active ingredient initially in Australia at the end of CY25 and with a target for mid-CY27 for regulatory approval. The company is well positioned given its existing commercial partnerships as well as the R&D and testing conducted on its two new active ingredients.
- 7) **BGT's management.** BGT has a highly qualified management team that is well equipped to take the company to the next stage of its life. The board as a collective possesses extensive experience in the pesticides industry as well as leading entities commercialising new products.
- 8) **BGT has a capital light business model.** BGT is within two years of submitting for regulatory approval so will require less capital than a company further away than that milestone. Its commercial partner STK will play a key part in funding the necessary studies that will be a key part of the company's application for regulatory approval of Qcide™. Once Flavocide™ and Qcide™ are commercialised, the company plans to have a royalty-based sales model, which will likely require the partner will bear a significant portion of sales and marketing costs.
- 9) **BGT is undervalued.** We have valued the company at 17.3c per share in our base case and 22.7c per share in our bull case. We foresee the company being re-rated as it edges closer to regulatory filing and eventual commercialisation. Although regulatory filing is a couple of years away, we see plenty of potential news flow in the interim including further positive data for Qcide™ and Flavocide™, the potential for further R&D partnerships as well as the potential expansion of existing partnerships.



Bio-Gene's technology and compounds

The herbicidal potential of beta-triketones

Flavocide™ is a naturally occurring beta-triketone and Qcide™ contains the diketone compound tasmanone.

Bio-Gene has two novel products (Flavocide™ and Qcide™) that are based on a novel technology platform. Flavocide is based on flavesone, a naturally occurring beta-triketone; and Qcide is a natural oil extracted from a particular eucalypt chemotype that contains the diketone compound tasmanone.

Beta-triketones have a range of biological properties and some include herbicidal activity via a mechanism of inhibiting a plant enzyme HPPD and have been used as herbicides across the world for over two decades, primarily for weed control in corn, barley, oat, rice, sorghum, sugarcane and wheat. Flavesone and tasmanone have been shown to have insecticidal activity that is enabling Bio-Gene to develop products for insect control to prevent damage to agricultural crops and for use in public health and animal health applications.

Qcide™ emerged from discovery by Bio-Gene's founders (researchers at Western Sydney University back in 2000) that beta-triketones or more specifically in tasmanone were existent in eucalyptus biomass (leaves and branches), a rare cultivar of an Australian eucalypt – the Gympie Messmate (*Eucalyptus cloeziana*). Patents were filed on the Qcide oil in 2002. The company listed in 2017, by which point it also had developed Flavocide™.

How beta-triketones differ from other insecticides and insecticide classes

Beta-triketones have a unique Novel Mode of Action (MoA) not shared in any other insecticide class today.

Before we delve into Flavocide™ and Qcide™ it is important to outline why beta-triketones are different to other insecticide classes. An insecticide class is not just any individual product (say a stereotypical Mortein fly or cockroach spray for example) but can be divided into groups of insecticide products based on their chemical structure and mode of action. In the example of Mortein, it uses Pyrethroid neurotoxins².

Why are beta-triketones different to other insecticide classes? Because they have a unique Novel Mode of Action (MoA) not shared in any other insecticide class today. A Mode of Action simply alludes to how a compound attacks a pest. There are over 30 different insecticide classes registered although 4 classes share 60% of the market: Neonicotinoids (with 24%), Pyrethroids (with 15%), Diamides (with 12%) & Organophosphates (with 8%)³.

These compounds tend to attack 4 broad areas: the nerve & muscles, respiration, growth capabilities and mid-gut, but they do so in different ways. For example, Diamides (the most recent major new class (MoA) to be commercialised, starting in 2008) closes the calcium channel preventing calcium ions being supplied to the pest, while Pyrethroids prevent the sodium channel from closing, causing uncontrolled nerve firing. Beta-triketones target a unique channel and interfere with it in a way that no other compound does – although the specific channel is subject to proprietary confidentiality for now, this will likely be disclosed in public once the company makes a regulatory submission.

Even though new insecticide products are common, new insecticide classes are rare. The odds are firmly stacked against the discovery of them. The

Even though new insecticide products are common, new insecticide classes are even more rare.

² Although this information is difficult to find on Mortein's company site, consumers can find these on individual cans as well as on supermarket websites. Product Details for Mortein NaturGard Fly & Mosquito Killer Eucalyptus Scent 320g on Woolworth's site notes it contains 'a natural plant-based pyrethrin active'.

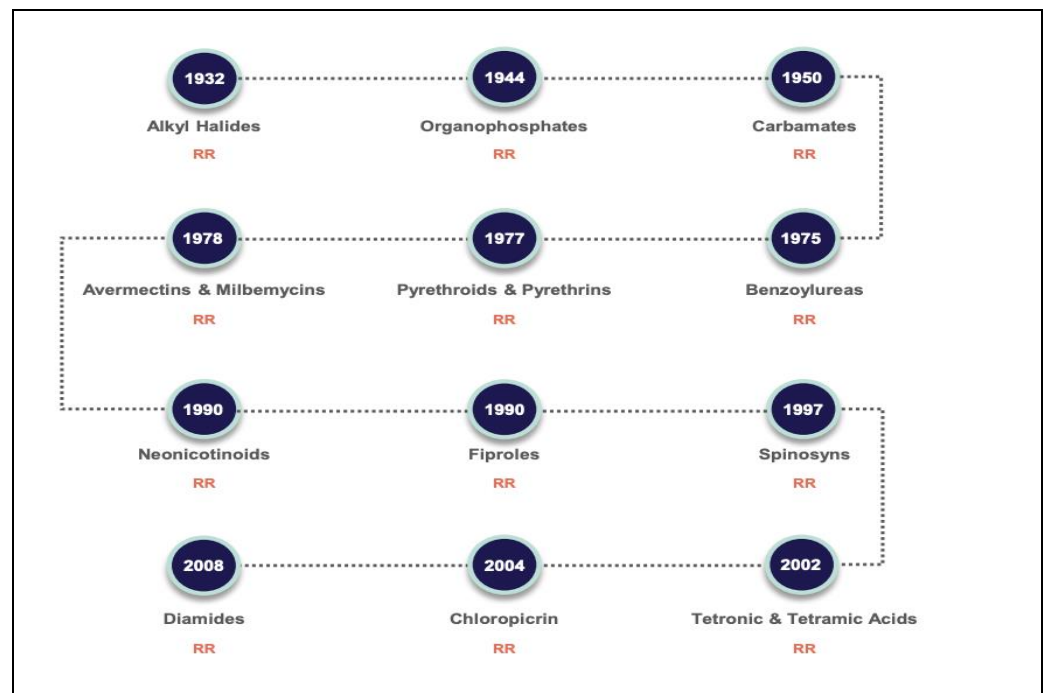
³ T.C. Sparks, et al. Pesticide Biochemistry and Physiology 167 (2020) 104587



Innovative Vector Control Consortium (IVCC) has a high throughput chemical screening process, with 4.5 M compounds screened, providing only 9 compounds worth pursuing, beyond the mere screening phase – *this effectively means the discovery by BGT of its beta-triketones as potential insecticides is a 1 in ~140,000 chance*. When such new classes are discovered, the value creation is significant, just look at the success of Diamides, discovered in 2008.

This is not just because their Modes of Action are unique, more effective in killing insects or both, but also because they may be able to counter problems of resistance or toxicity amongst beneficial insects, animals and humans. Consider Neonicotinoids for instance, although they have not been banned as an entire chemical group yet, use restrictions have been implemented and sales have reduced through public pressure linked to toxicity to bee populations. At the same time, many of these can generate substantial annuity-type global sales (Figure 2). We have already mentioned the global sales of Diamides – which reached US\$1.5bn in sales within 5 years of being commercialised and has remained consistently above that level ever since. Consider also that Organophosphates still generate over \$1.7bn p.a. even though they were first discovered and commercialised 8 decades ago.

Figure 2: Significant chemical discoveries (US\$250m+ in Annual Insecticide Sales)



Source: Company

Making a long story short

Commercialisation of Flavocide and/or Qcide would mark a significant and unique chemical discovery, with the potential for significant annual sales.

The bottom line is that the commercialisation of Flavocide™ and/or Qcide™ would represent the first such beta-triketone insecticide products and would thus mark a significant and unique discovery, with potential for significant annual sales (below Figure). They would have a Mode of Action not present in any other insecticide product on the market today and would thus be extremely lucrative in the context of all the market tailwinds – increasing insecticide resistance, the growing population and increasing insect-based



diseases. Specifically, it would also be lucrative for BGT's business partners, that would help it commercialise Flavocide™ and/or Qcide™ with a royalty-based agreement – we will return to BGT's intended commercialisation model in a later section of this report.

Flavocide™ and Qcide™

Flavocide™ has a unique mode of action not present in any other commercial products today, one that specifically addresses insecticide resistance.

Flavocide™ is based on a naturally occurring compound, flavesone, but produced synthetically. The company has realised it would be easier to develop large-scale chemical production to meet global demand, rather than extracting the compound from plants that produce it in low quantities. Flavocide™ has a unique mode of action not present in any other commercial product today, one that specifically addresses insecticide resistance. The fact that resistant pests have not encountered any other marketed insecticide that is able to overcome their resistance bodes well for how Flavocide™ will work.

Flavocide was developed in collaboration with the CSIRO. This research was not just about evaluating the effectiveness of killing insects, but also if it could be produced cost effectively at commercial scale. Other research has been focussed on measuring the toxicity to beneficial insects, such as bees and parasitic wasps (that prey on harmful pests). Indeed, research found that Flavocide™ is up to 5,000 times less toxic to bees upon ingestion compared to some existing insecticides. The partnership with CSIRO assisted BGT with obtaining grants as well as having it participate in its Kick-Start program. The collaboration has also led to a new chemical synthesis process for producing Flavocide™ which provides for improved yield, with over 80% recovery rates.

The Insecticide Resistance Action Committee (IRAC) has indicated that Flavocide™ has a significantly different MoA (Mode of Action) from any other class of chemistry used or classified by IRAC. The last significant MoA class which was introduced was Diamides in 2008.

Various efficacy studies have been undertaken, including through the University of Technology in Sydney and Purdue University in America that demonstrated Flavocide™ has great efficacy (Figures 3 & 4) and can control a variety of pest species resistant to currently available chemical products. This includes mosquitos at both the adult and larvae stage and species that are responsible for several of the most dangerous vector diseases including (but not limited to) Yellow Fever, Malaria, Zika and Dengue Fever.



Figure 3: Results of UTS research on Flavicide

Combo	Mosquito	Conc'n mg/mL	KD50 (sec)	KD90 (sec) Q-test	KD100 (sec)	Mortality @24h	Combo
F+P	<i>Aedes</i>	25+2.5	240	410 a	600	100%	F+P
F+P	<i>Aedes</i>	25+1.25	360	444 b	720	100%	F+P
Permethrin	<i>Aedes</i>	1.25	300	498 b	840	100%	Permethrin
Permethrin	<i>Aedes</i>	2.5	360	510 b	840	100%	Permethrin
Flavicide	<i>Aedes</i>	25	600	788 e	1080	100%	Flavicide
F+P	<i>Culex</i>	25+2.5	600	800 a	1080	100%	F+P
F+P	<i>Culex</i>	25+1.25	840	1068 b	1500	100%	F+P
Permethrin	<i>Culex</i>	1.25	840	1047 b	1800	100%	Permethrin
Permethrin	<i>Culex</i>	2.5	1500	1745 d	2100	100%	Permethrin
Flavicide	<i>Culex</i>	25	1800	1933 e	2100	100%	Flavicide

Source: Company

Figure 4: Results of Purdue University Research on Flavicide

Target Species	Strain	Life Stage	Test	Flavicide	Control (Permethrin)
<i>Ae. aegypti</i>	LVP*	L3 Larvae	LC ⁵⁰ (24h)	40.9 µg/mL	25.9 ng/mL
	PRS**	L3 Larvae	LC ⁵⁰ (24h)	38.7 µg/mL	164.2 ng/mL
	LVP*	L3 Larvae	LT ⁵⁰	2.3h	5.4h
	PRS**	L3 Larvae	LT ⁵⁰	1.4h	14.7h
	LVP*	Adult	LD ⁵⁰ (24h)	2.6 mg/mL	0.18 µg/mL
	PRS**	Adult	LD ⁵⁰ (24h)	1.6 mg/L	13.6 µg/mL
<i>An. gambiae</i>	Kisumu #	Adult	LD ⁵⁰ (24h)	0.5mg/mL	
	RSP ##	Adult	LD ⁵⁰ (24h)	0.7mg/mL	

Source: Company

Note: LVP = Liverpool strain (susceptible); PRS = Puerto Rico strain (resistant), # = SP susceptible, ## = SP resistant

Qcide™ is a botanical oil product containing several compounds with tasmanone as the major component. It is extracted from the leaves and branches of a rare Australian eucalypt cultivar selected by BGT, the Gympie Messmate, by utilizing a steam distillation process. *Eucalyptus cloeziana* trees are currently being grown in plantation farming systems by sub-contractors in Far Northern Queensland (Figure 5). BGT has filed PBR applications for high-tasmanone tree cultivars. The oil could be used as an insecticide for use against household and agricultural pests.



Research dating back 20 years found that certain eucalyptus leaves express high levels of the natural compound tasmanone, that showed high insecticide effects.

Like Flavocide™, Qcide™ too has undergone a range of research collaborations involving some of Australia's leading academic and research institutions. These are not just focused on demonstrating efficacy of the product against pests, but also how to deliver process improvements in relation to tree growing plant propagation, tissue culture, chemistry analysis and oil extraction. This will ultimately ensure BGT can deliver a product that can meet the stringent demand of end markets.

Figure 5: Gympie messmate grown from tissue culture and in the field in Northern Queensland



Source: Company



Bio-Gene’s market opportunity

Insect resistance means there’s a need for new insecticides

There is an urgent need for a new generation of insecticides that can work against an insect population that is growing and becoming increasingly resistant to the current commercially available insecticides.

As we have touched on, there is an urgent need for a new generation of insecticides that can work against an insect population that is growing and becoming increasingly resistant to the current commercially available insecticides.

There are ~600 insect species that are resistant to at least one class of insecticide and all 4 major classes of insecticide have recorded at least one pest with resistance. Some insect species are resistant to all of the major classes (Figure 6).

How can insects become resistant to insecticides? The most common mechanisms are that insects (1) break down the toxin with their internal enzymes, (2) detect and avoid it or (3) by modifying the target site (such as the calcium channel) to stop the effect or just absorb the insecticide slower. Further complicating the matter is that once pests are resistant to one type of insecticide MoA, it becomes resistant to the whole class (i.e. pyrethroids) and may even develop cross-resistance, which is the ability to become resistant to an additional class of insecticide. Figure 6 depicts the results of the contract research at Purdue University with Flavocide™ against certain resistant species of mosquitos. Tested mosquitos have developed resistance against long standing insecticide classes.

Figure 6: Mosquito resistance to insecticides

		Mosquito Species			
		<i>Aedes sp.</i>	<i>Anopheles sp.</i>	<i>Culex sp.</i>	
Resistance Recorded	Organochlorines	✗	✗	✗	Discovered 1930
	Organophosphates	✗	✗	✗	Discovered 1944
	Pyrethroids	✗	✗	✗	Discovered 1977
	Carbamates	✗	✗	✗	Discovered 1950
	Flavocide	✓	✓	✓	New Chemistry

Legend
 ✗ Resistance recorded ✓ Efficacy confirmed

Source: Company

Beyond the concern of insect resistance, others include:

- **Increasing food and fibre requirements** in the context of a continually growing world population, set to be over 9bn in 2050, and consequently the need for higher yields from crops. It is estimated that 40% of the



- world's crops are lost to pests every year, equivalent to over 1.3bn tonnes of good.
- **Climate change**, which has potential to promote proliferation of certain insects and increased insect pressure. It could also promote a larger distribution of insects to countries where previously no insect pressure was observed.
 - **The need for products with lower human toxicity profiles** and less harmful to beneficial insects is needed in agriculture. Some insects are beneficial, and they help protect and pollinate crops but can be easily killed when pesticides are used – bees are the most obvious example here.
 - **Increasingly urbanised populations**, can lead to greater potential for outbreaks of insect-borne diseases through greater congregations of people and insects' adaptation to living in an urban environment. Prominent examples include malaria and yellow fever.

Developing new insecticides is easier said than done, even though it is lucrative

Notwithstanding these needs, new products have been slow to be discovered and brought to market. There have been no major insecticides with a new Mode of Action (MoA) commercialised since 2008, and the class in question was Diamides, first commercialised in a product belonging to Japanese chemical producer Nihon Nohyaku. These insecticides are now generating US\$2.3bn in global sales annually and the class of Diamides was responsible for 12% of the market in 2020. Looking at some specific markets, there has only been one insecticide approved for malaria since the 1980s, which was BASF product Interceptor G2 and that was not a product that had a new MoA. Why has this been the case? Because (like the pharmaceutical industry) the extensive time, costs and research required to bring new products to market. This is even though new products would offer the opportunity for differentiation. There is an opportunity for smaller companies such as BGT to do the hard work and develop these products with the intent of bringing them to market and partner with larger companies to make the dream a reality.

The five key markets

BGT has a total of five key markets that represent a total addressable market of over US\$31bn (Figure 7): Crop Protection, Grain Storage, Public Health, Consumer Applications and Animal Health.

Crop Protection: This is the most important segment, accounting for 52% of the US\$31bn Addressable Market. The world needs increased food production to feed the growing population, while limiting adverse impacts and pest management problems. Insects and pests can impact production and quality. It is estimated that insects destroy 18-26% of overall annual crop production worldwide. 13-16% of losses occur in the field before harvest, although damage can also occur post-harvest. Crop production losses can be up to 50% with some commodities. It is estimated that US\$20.8bn damage per annum occurs worldwide, a figure that has increased 30% in the past decade.

BGT has a total of five key markets that represent a total addressable market of over US\$31bn.



Figure 7: BGT's key target markets



Source: Company

Grain storage: Grain storage is estimated to be worth US\$907m by 2026. The company, while categorising it as a market in its own right, has included it in the Crop Protection market. The problems BGT's products can solve are eerily similar. Between 25% and 33% of the global grain crop is lost during storage, a high proportion of which is due to insect attack with examples including beetles such as the Lesser Grain Borer. Any grain that is found to be pest infected has no prospect of being sold in any market. There is no single solution that controls all major pests that impact stored grain. Moreover, there is 59% less arable land than there was in 1950 and there's a need to produce an additional 1.4% every year.

Public Health: This is a US\$4bn segment and is mostly about the impact of mosquito diseases. Mosquitos have been described by the US Centers for Disease Control and Prevention (CDC) as 'The World's Deadliest Animal' because they are responsible for more human deaths than any other creature on earth. Vector-borne diseases are 17% of all illnesses and disability worldwide and 25% of all emerging infectious diseases. Mosquitoes claim over 700,000 lives annually including Malaria, Zika and Yellow Fever, which are diseases mostly spread through the saliva of mosquitos that contact the human body when mosquito mouthparts touch the body. And this is not just a problem in the 'Third World' – to illustrate, over 32,000 cases of Dengue fever were recorded in Singapore in 2022, a country with little over 5 M people. The World Health Organisation aims to reduce mortality by at least 75% and case incidence by at least 60% by 2030. This is easier said than done given increasing levels of resistance amongst the mosquito population. At the same time, new products also need to have lower toxicity and an eco-friendly profile.

Given the above contradiction, few insecticides have been developed for the control of arbovirus mosquito vectors in disease endemic countries over the last 30-years.

Consumer Applications: This segment is worth 16% of the US\$31.1bn Addressable Market and mostly consists of consumer insecticides – sprays, aerosols, garden products, lotions and repellents. Most readers of our reports would be thinking of any one (or all) of the following three pests: House flies,



cockroaches and mosquitos. House flies and cockroaches are vectors of dozens of diseases including cholera, tuberculosis, salmonella and gastroenteritis. Given these pests are almost constantly exposed to these products, resistance is widespread – although we wouldn't imagine many readers would need us to say that for them to know.

Like the segments mentioned above, demand is rising given the rising pest population, increasing urbanisation, not to mention increasing resistance in the insect populations. Also, there is more demand specifically for products that have a 'greener' profile, referring to products that are safer for human, to beneficial insects like bees and more environmentally friendly such as less persistent in the environment. Consider that Mortein uses Pyrethroids as its major insecticide ingredients – linked to the development of ADHD in young males and abnormal oestrogen levels in females. In addition, Bunnings was forced to pull neonicotinoid insecticide products from its shelves due to consumer concerns about their effect on bee populations. It would be the botanical oil Qcide™ that BGT would bring to this market. As a naturally occurring product from a rare eucalyptus species, it could really claim to be a 'green product'.

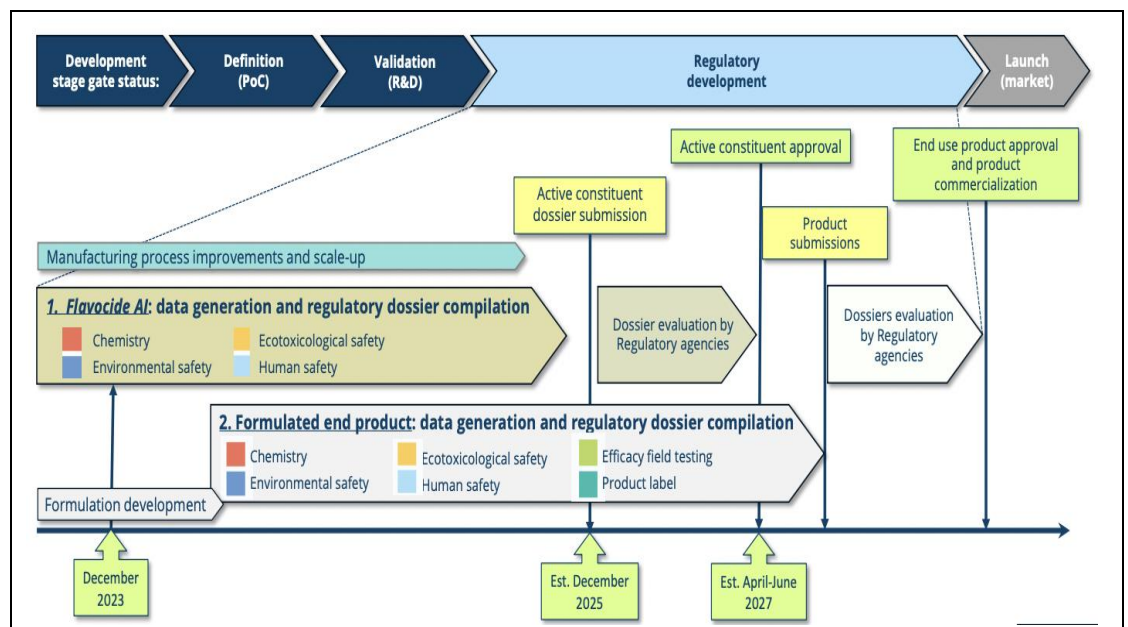
Animal Health is a substantially large market responsible for 19% (~\$6bn) of the \$30bn global market and includes both products to protect domestic pets as well as livestock. The world needs to feed its population and meat is an important source of nutrition – meat production has quadrupled over the past 50 years. Cattle ticks are just one example of insects that need to be taken care of, up to 80% of cattle are exposed to them and this issue costs Australian cattle industry A\$175m, India US\$499m and globally US\$13.9-19.7bn.



BGT's plan to market

BGT intends to eventually commercialise Flavocide™ and Qcide™. It intends to file for Flavocide™ regulatory approval at the end of CY25 and, if approval is granted, the green light is expected to come in the June quarter of CY27. Neither product would be viable without proof of superior efficacy and BGT has, to that end, undertaken studies not just with universities but with commercial companies and qualified laboratories. BGT already has several commercial agreements in place to exploit Flavocide™ and Qcide™ once regulatory approval is obtained. Figure 8 shows the pathway to market, and where BGT is at, while Figure 9 shows all BGT's current commercial partnerships.

Figure 8: The regulatory pathway to approval



Source: Company, APVMA



Figure 9: BGT’s partners

<i>Flavocide® (Active constituent)</i>						<i>Pre-registration</i>	BIO-GENE TECHNOLOGY	
Description	Code	Sector	Target Market	Target Species	Use	Stage	Partner	
Formulated products	Grain Protectant	F8	Crop protection	Admixture to grain (in combination for IPM)	Lesser grain borer Rice weevil, Flour beetle Saw-toothed grain beetle Rusty red grain beetle	Professional use	Formulation development	GRDC GRASS RESEARCH & DEVELOPMENT CORPORATION
	Outdoor Space Spray	F11	Public health	Flying insects	Mosquitos	Professional use	Formulation development	clarke (USA & Cayman Is.)
	Indoor Barrier Spray	F28	Public health	Flying & crawling insects (residual)	Mosquitos, ants, cockroaches	Professional use (kill & repel)	Formulation development	-
	Outdoor Barrier Spray	F13	Public health	Flying & crawling insects (residual)	Mosquitos, ants, cockroaches	Professional use (kill & repel)	Formulation development	clarke (USA & Cayman Is.)
	Indoor Space Spray	F12	Consumer	Flying & crawling insects	Mosquitos, house flies, ants	Personal use	Formulation development	EVERGREEN Garden Care UK, EU, AU & NZ
<i>Qcide® (Active constituent)</i>						<i>Pre-registration</i>	stk bio-ag technologies	
Formulated products	Indoor Space Spray	Q18	Consumer	Flying insects	Mosquitos & house flies	Personal use	Formulation development	-
	Outdoor Barrier Spray	Q13	Consumer	Flying insects	Mosquitos & house flies	Personal use	Formulation development	-
	Outdoor Garden Spray	Q20	Consumer	Fruit & vegetables, ornamentals	Sucking pests: mites, aphids, orange stink bug, scale	Personal use	Formulation development	EVERGREEN Garden Care AU & NZ

Source: Company

Partnerships

Clarke: Clarke Mosquito Control is globally known to be one a major mosquito control company. BGT’s association with Clarke began in August 2019 with a material transfer agreement (MTA). This allowed for initial testing of Flavocide™ and Qcide™ on three significant mosquito species – Anopheles, Aedes and Culex – to see if BGT’s assets would control these mosquito species. After positive initial testing, BGT and Clarke signed a formal partnership in April 2020 to further develop BGT’s technology, specifically to determine a potential commercial formulation.

In April 2022, Clarke and BGT signed an initial Commercial Development Agreement that was updated 12 months later. The deal provided for BGT to supply Clarke with the Active Ingredient Flavocide™ and to focus on data generation and preparation and submission of the Active Ingredient in the USA. Clarke, meanwhile, would have the responsibility of developing and registering the end use product. The deal provided BGT with an immediate milestone payment, technical transfer fees and other milestone payments over time - the specific figures were undisclosed. The deal covered the United States and the Cayman Islands.

Evergreen Garden Care: Evergreen is a garden care company with a market-leading presence in Europe and Australasia, producing high quality garden care products designed to help people create their own green oasis amid the rush of modern life Its products include the following brands: Scotts, Osmocote, Miracle-Gro, Substral and Fertiligene.

Evergreen and BGT signed a commercial development agreement in October 2021 to develop new insecticide solutions for the consumer market. It provided for Evergreen access to BGT’s proprietary technology and data so that Evergreen could evaluate and develop green product solutions targeting



insects in the UK, Europe, Australia, and New Zealand. The deal provided for license and milestone payments to be made during development and for an undisclosed royalty on all commercial sales on any products commercialised using BGT's technology.

STK Bio-Ag: STK is an Israel-based company known for pioneering 'hybrid' fungicides in the agricultural market segment, which empowers growers to enhance resistance management, achieve higher yields, reduce chemical residues, and adhere to stringent chemical residue limits imposed by various countries, regions and retail chains.

In early 2023, STK and BGT signed a term sheet (which was made into a binding agreement in July 2023) which granted STK a non-exclusive license to develop Qcide™ for Crop Protection, aquaculture, professional turf and ornamental markets. Under the deal, STK is responsible for all costs associated with securing registration of the active ingredient Qcide™ while BGT would retain exclusive rights to the public health, animal health and consumer markets for Qcide™ as well as full access to the registration data package to support other commercial opportunities (including Crop Protection).

Grain Research & Development Corporation (GRDC): This collaboration started in a 4-way partnership with the GRDC, BGT, BASF and the Queensland Government. Testing with Flavocide™ under this partnership (concluded in mid-2022) showed it could control lesser grain borer, flour beetle, saw-toothed grain beetle, flat grain beetle and rice weevil in grain storages for up to 13 months - 9 months is the industry standard. In May 2023, GRDC signed a Letter of Support re-affirming its support for BGT to achieve registration and commercialisation of Flavocide™ as a stored grain protectant in Australia.

The Regulatory approval pathway

The crucial step in the commercialisation of Flavocide™ and Qcide™ is obtaining regulatory approval. This is a necessary step for any new insecticide.

In Australia, the appropriate body is the Australian Pesticides and Veterinary Medicines Authority (APVMA) and the Environmental Protection Agency (EPA) in the USA.

BGT is planning on making an active constituent dossier submission for Flavocide™ in December 2025. The average time to approval is 15 months, providing for a potential green light in the June quarter of 2027.



Our valuation of BGT

We value Bio-Gene at 17.3c per share in our base case and 22.7c per share in our bull case (Figure 10). We have used a Sum of the Parts approach, using projected Discounted Cash Flows for Flavocide™ and Qcide™ as well as the company's cash balance. Our assumptions are as follows.

- **Commercialisation time frame and model.** We assume that Flavocide™ is commercialised mid-way through FY27, allowing for an 18-month time frame between the projected filing for regulatory approval (end of CY25), the regulator's consideration and gradual market ramp up. For Qcide™, we assume it is commercialised in FY29. We assume a royalty-based model with BGT taking a 12% royalty on sales. We assume that within 5 years, Flavocide™ sales reach US\$1.06bn, leading to US\$127m in peak royalty revenue. For Qcide™, we assume sales reach US\$579m, with peak royalty revenues of US\$70m. We assume an 0.68 AUD/USD exchange rate. Our model expands for 10 years post-commercialisation, although we have not assumed any terminal growth beyond that period.
- **Market size and penetration.** We assume that Flavocide™ is commercialised in the Crop Protection and Public Health opportunities, whilst Qcide™ is commercialised against Consumer Applications and Animal health. We assume these products ultimately capture 4% of these markets, a figure we think is conservative given the track record for new Insecticide Classes in terms of how quickly these can capture significant market shares, particularly Diamides. We assume these markets grow by 2% a year, which we consider to be conservative given many of these markets are expected to grow faster⁴.
- **Cost model.** We assume cash costs to the company (General Corporate and R&D Expenses) are 70% of royalty-based sales and the company faces a 30% corporate tax rate. This may be a highly conservative assumption to make given BGT will have a low capital intensity under a licensing and royalty business model, although it will ultimately depend on what kind of commercialisation framework and with what partners it opts to go with.
- **Discount rate.** We arrive at a WACC of 16.2%, reflecting an 8% equity premium, a 4% risk-free rate of return and a 1.5x beta. Our final NPV of both Flavocide™ and Qcide™ have been further discounted by 50% for probability.
- **Sum of the Parts:** Flavocide™ is ~67% of our valuation of the company in both our base and bull cases, Qcide™ is 25% and the balance is the company's current cash on hand (\$3m as at the close of FY23).
- **Base and Bull case differences:** Our bull cases for both Flavocide™ and Qcide™ have two key differences. First, the assumption of a 5% market capture. And second, we assume cash costs to the company are 65% of royalty-based sales. The premium to BGT shares in our bull case is 32%.

Figure 10 shows our key metrics while Figure 11 shows summary for the upside potential of the stock. The midpoint of our valuation range is A\$0.20 per share.

⁴ The global home & garden pesticides market is forecast to grow at a CAGR of 6% between 2023 and 2030 according to Straits Research and GrandView Research.



Figure 10: Our key valuation metrics

DCF Assumptions (Base case)	Flavocide	Qcide
Total market size (US\$bn)	20	11
Market share	4%	4%
Royalty	12%	12%
Market growth	2%	2%
Peak sales (US\$m)	1,062	579
Cash cost (% Royalty based sales)	70%	70%
Peak royalty revenue (US\$m)	127	70
AUD/USD	0.68	0.68
Probability Factor	50.0%	50.0%
Discount Rate	16.2%	16.2%
Tax Rate	30.00%	30.0%

Estimates: Pitt Street Research

Figure 11: Our valuation of Bio-Gen

Sum of the Parts Valuation	Base Case		Bull case	
	A\$m	A\$ps	A\$m	A\$ps
Drugs				
Flavocide	23.19	0.115	31.29	0.155
Qcide	8.63	0.043	11.50	0.057
rNPV	31.82	0.158	42.78	0.212
Cash (close of FY23)	2.99	0.015	2.99	0.015
Debt (close of FY23)	-	-	-	-
Equity Value	34.81	0.173	45.77	0.227
Current Price		0.049		0.049
Upside		253%		364%

Estimates: Pitt Street Research

We foresee the stock being re-rated to our valuation range if and when the following events occur:

- Advancement towards regulatory filing, a step estimated in December 2025 for Flavocide™.
- Results of testing proving the ability of BGT's compounds both in their own right and also in combination with other compounds.
- The signing of further R&D collaboration agreements, particularly with industry bigwigs, that could eventually become sales agreements.
- Continuation of existing commercial partnerships to later stages and expanded partnering.



Risks

We see the following key risks to our investment thesis:

- **Execution risk:** Any delays or difficulties in executing the company’s strategy will impact investors’ confidence in the company.
- **Competitive risk:** The market is highly competitive and success will depend on the ability of the company to prove its products are superior to alternatives on the market.
- **Key personnel risk:** There is the risk that the company could lose key individuals and be unable to replace them and/or their contribution to the business.
- **Capital risk:** There is the risk the company may need capital. Amidst higher capital costs, this will reduce the fundamental return for would-be investors and make it more difficult to raise capital. An inability to raise capital, if required, may mean the company won’t be able to execute on its key initiatives.
- **R&D risk:** There is a risk that future R&D work undertaken may not be as vindicative of BGT’s products as past work has done. This would potentially jeopardise the company’s commercialisation plans.

BGT’s leadership team

The company’s current board and leadership composition is as below (Figure 12).

Figure 12: BGT’s Board members and senior management

Name and Designation	Profile
<p>Alex Ding Non-Executive Chairman</p>	<ul style="list-style-type: none"> • Mr Ding was a partner at two leading Australian law firms, and is a recognised expert in mergers and acquisitions, capital markets, and general corporate and governance law. • He has advised many large ASX, LSE and US listed companies, foreign government-controlled entities and substantial private companies and funds on acquisitions, divestments, corporate finance transactions, joint venture arrangements, restructurings, corporate governance and disputes strategy. • He has been named on The Best Lawyers in Australia list and has over 25 years of experience as a corporate lawyer.
<p>Tim Grogan Managing Director & Chief Executive Officer</p>	<ul style="list-style-type: none"> • Mr Grogan brings more than 30 years’ experience and expertise to Bio-Gene, with a successful track record of delivering growth in the Agtech, food and Life Sciences sectors. He has deep multi-disciplinary experience in the management of new product development, commercialisation, capital raising and corporate governance. • Mr Grogan has held several key executive roles in listed and non-listed companies, including with pharmaceutical development company, Starpharma (ASX:SPL), where he worked to steer it through the IPO process and establishing several commercial relationships globally. He has also served as CEO of SIRA Pty Ltd, where he led the commercial development of technologies to produce new types of healthier sugar. Most recently, he has been consulting to companies in the health and medical technology sectors in Australia, providing strategic, government and regulatory advice. • Mr Grogan holds a Bachelor of Law and a Bachelor of Science, majoring in chemistry, from the University of Melbourne.



<p>Andrew Guthrie Non-Executive Director</p>	<ul style="list-style-type: none">• Mr Guthrie has dedicated his career to agriculture and worked for 32 years with one of the world's leading agriculture companies, Syngenta, and predecessor companies around the world. After building his early career in sales, marketing and supply chain roles in Australian agriculture, Mr Guthrie spent 20 years working internationally with assignments in the United Kingdom, Switzerland, Hong Kong, Singapore, Thailand, Japan and China. He gained significant experience in diverse cultural environments that require broad leadership skills.• Mr Guthrie has a strong understanding of corporate governance and the risk management required to successfully grow business in emerging markets. He was part of Syngenta's Global Crop Protection Leadership team that was responsible for business strategy that leveraged Syngenta's extensive research and development capability to invent, gain regulatory approval and launch new products, including insecticides, to agricultural markets globally.
<p>Chris Ramsey Non-Executive Director</p>	<ul style="list-style-type: none">• Mr Ramsey has over 30 year's experience in the agricultural sector across business start up, development, marketing and broader agronomy. He has held leadership roles in Bayer, BASF and Nufarm among others, operating in both technical and managerial roles. He brings with him significant experience across customer engagement and product marketing and has a history of partnership development and sourcing after having spent the earlier years of his career in technical agricultural roles.• Mr Ramsey currently acts as non-executive director of North West Phosphate, a phosphate exploration and production business and principal director of a boutique agribusiness consulting firm. Chris holds a BSc (Honours) in Rural Sciences and a GradDip in Agribusiness.
<p>Peter May Executive Director (Research and Development)</p>	<ul style="list-style-type: none">• Mr May has over 20 years' experience in the Australian and international crop protection markets with companies Incitec, Orica and Crop Care Australasia (now part of Nufarm). His various roles included business management of pesticide products, export sales and toll formulation operations. During this period Peter developed extensive experience in international crop protection markets.• Mr May is a graduate member of the Australian Institute of Company Directors (AICD), a member of the Australian Environmental Pest Managers Association (AEPMA) and the Mosquito Control Association of Australia (MCAA). He holds a Bachelor of Applied Science (Rural Technology) (First Class Honours) from the University of Queensland and an MBA from the Queensland University of Technology.
<p>Roger McPherson CFO and Company Secretary</p>	<ul style="list-style-type: none">• Mr McPherson has more than 30 years' experience in senior finance roles in a wide variety of industries. His early career included working with a chartered accounting practice and two years with the Australian Taxation Office.• Mr McPherson has worked for a number of SMEs both listed and unlisted including Patrys Limited, TPI Enterprises Ltd and eChoice Home Loans. In these roles he was responsible for all financial affairs and corporate administration as well as assisting in investor relations activities. He has over 20 years of biotechnology and pharmaceutical experience.• In addition to his role with Bio-Gene, Mr McPherson also provides CFO and Company Secretarial services to other listed and unlisted entities. He holds a B. Bus (Accounting) – Curtin University, is a member of CPA Australia and a Graduate of the Australian Institute of Company Directors.



Comparable companies

We have considered companies in the insecticide space as well as those with a more general focus on Fertilisers and Agricultural Chemicals.

Bayer CropScience (BSE:506285) - Bayer CropScience engages in the manufacture, sale, and distribution of insecticides, fungicides, herbicides, and various other agrochemical products and corn seeds in India, Germany, Bangladesh, and internationally. Bayer CropScience Limited was founded in 1863 and is based in Thane, India.

Corteva (NYSE:CTVA) - Corteva operates in the agriculture business. It operates through two segments, Seed and Crop Protection. The Seed segment develops and supplies advanced germplasm and traits that produce optimum yield for farms. It offers trait technologies that enhance resistance to weather, disease, insects, and herbicides used to control weeds, as well as food and nutritional characteristics. This segment also provides digital solutions that assist farmer decision-making with a view to optimize product selection and maximize yield and profitability. The Crop Protection segment offers products that protect against weeds, insects and other pests, and diseases, as well as enhances crop health above and below ground through nitrogen management and seed-applied technologies. This segment provides herbicides, insecticides, nitrogen stabilizers, and pasture and range management herbicides. It serves agricultural input industry. The company operates in the United States, Canada, Latin America, the Asia Pacific, Europe, the Middle East, and Africa. Corteva is headquartered in Indianapolis, Indiana, although its agriscience subsidiary is located in Stockholm, Sweden.

Central Life Sciences - Central Life Sciences manufactures and markets professional and consumer products in agriculture, veterinary, animal health, specialty pest control, horticulture, vector, and public health/vector control markets. The company manufactures products to control economic-threatening, nuisance, and disease-carrying insects in specialty agricultural and public health markets. It offers mosquito control, fly and biting fly control, inflammation management, stored product insects control, flea and tick protection, and fire ant control solutions; insect pest control solutions for nurseries and greenhouses; toolboxes for professional pest control operators; veterinary surgical devices, including a range of sutures, tissue adhesives, and surgical drapes; and active ingredients. The company is headquartered in Schaumburg, Illinois.

Detia-Degesch – Degesch is a stored grain protection and pest control company with headquarters in Laudenbach, Germany as well as an American subsidiary office in Weyers Cave, Virginia. Its products are based on metal phosphides and its brands include Phostoxin, Magtoxin, Arvalin and Delu.

Envu - Envu was formed when Bayer sold its environmental science professional business to a private equity firm in 2022. Envu offers dedicated services in: Professional Pest Management, Forestry, Ornamentals, Golf, Industrial Vegetation Management, Lawn & Landscape, Mosquito Management, and Range & Pasture. Envu's portfolio consists of over 180 trusted and well-known brands. The company employs nearly 900 people and operates in more than 100 countries with four global innovation hubs.

FMC Corp (NYSE: FMC) - A chemical company which serves the agricultural market. It develops, markets, and sells insecticides, herbicides, and fungicides. FMC acquired a large part of DuPont's crop protection activities. These products are used in agriculture to enhance crop yield and quality by controlling a broad spectrum of insects, weeds, and diseases, and in non-agricultural markets for pest control. Insecticides are used to control a wide



spectrum of pests and the herbicide portfolio targets a large variety of difficult-to-control weeds. It also invests in a plant health program that includes biological crop protection products, seed treatments and micro-nutrients. It has facilities across several continents, including Asia, South America, the Middle East, and Africa. FMC is headquartered in Philadelphia, Pennsylvania, the US.

Hedley Technologies Ltd- Hedley Technologies owns Protect-It, a non-chemical food-safe grain insecticide product used as a preventative treatment against insect infestations in stored grains.

Nufarm (ASX:NUF) - Nufarm, together with its subsidiaries, develops, manufactures, and sells crop protection solutions and seed technologies in Europe, the Middle East, Africa, North America, and the Asia Pacific. The company operates through Crop Protection and Seed Technologies segments. The Crop Protection segment solutions include herbicides, insecticides, and fungicides that help growers protect crops against weeds, pests, and diseases. The Seed Technologies segment operates base seeds, bioenergy, omega-3 and seed treatment platforms, as well as sells seeds and oil based products. It also focuses on crops, such as cereals; corn; soybean; pasture, turf, and ornamentals; and trees, nuts, vines, and vegetables. In addition, the company provides seed treatment products for the protection and treatment of damage caused by insects, fungus, and disease. Further, it distributes sunflower, sorghum, and canola seeds. Nufarm Limited was founded in 1916 and is headquartered in Melbourne, Australia.

Rallis India (NSEI:RALLIS) - Rallis India manufactures and markets agri-inputs in India and internationally. The company offers crop protection products, including insecticides, herbicides, fungicides, and bio pesticide; organic fertilizers and plant growth nutrients; seeds, such as maize, watermelon, cauliflower, cabbage, bottle gourd, cucumber, bitter melon, chilli, okra, tomato, millet, paddy, and cotton; and animal nutrition products. It also provides household products, such as Termex, an insecticide for termite control; Sentry, a synthetic pyrethroid insecticide; and Ralligel plus, a chemical spray for cockroach control. In addition, the company offers contract manufacturing services for crop protection chemicals, specialty chemicals, polymers, and intermediates. It sells its products through a network of dealers and retailers. The company was incorporated in 1948 and is based in Mumbai, India. Rallis India Limited operates as a subsidiary of Tata Chemicals Limited.

Scotts Miracle-Gro (NYSE:SMG) - The Scotts Miracle-Gro Company, together with its subsidiaries, manufactures, markets, and sells products for lawn, garden care, and indoor and hydroponic gardening in the United States and internationally. It operates through three segments: U.S. Consumer, Hawthorne, and Other. The company provides lawn care products, comprising lawn fertilizers, grass seed products, spreaders, and other durable products, as well as lawn-related weed, pest, and disease control products; and gardening and landscape products, which include water-soluble and continuous-release plant foods, potting mixes, garden soils, mulches and ground cover products, plant-related pest and disease control products, organic garden products, and live goods and seeding solutions. It offers hydroponic products that help users to grow plants, flowers, and vegetables using little or no soil; lighting systems and components for use in hydroponic and indoor gardening applications; insect, rodent, and weed control products for home areas; and non-selective weed killer products. The company sells its products under the Scotts, Turf Builder, EZ Seed, PatchMaster, Thick'R Lawn, GrubEx, EdgeGuard, Handy Green II, Miracle-Gro, LiquaFeed, Shake 'N Feed,



Hyponex, Earthgro, Nature Scapes, Ortho, Miracle-Gro Performance Organics, Miracle-Gro Organic Choice, Whitney Farms, EcoScraps, Mother Earth, Botanicare, General Hydroponics, Cyco, Gavita, Agrolux, HydroLogic Purification System, Gro Pro, AeroGarden, Titan, Tomcat, Ortho Weed B Gon, Roundup, Groundclear, and Alchemist brands. It serves home centers, mass merchandisers, warehouse clubs, large hardware chains, independent hardware stores, nurseries, garden centers, e-commerce platforms, and food and drug stores, as well as indoor gardening and hydroponic distributors, retailers, and growers. The Scotts Miracle-Gro Company was founded in 1868.

Sumitomo Chemical Company (TSE:4005) - Sumitomo Chemical Company, Limited engages in Chemicals & Plastics, energy and functional materials, IT-related chemicals, health and crop sciences, pharmaceuticals, and other businesses worldwide. Its Essential Chemicals & Plastics segment offers synthetic resins, such as polyethylene, polypropylene, and polymethyl methacrylate resins; raw materials for synthetic fibers; and various industrial chemicals. The company's Health & Crop Sciences segment offers crop protection chemicals, fertilizers, feed additives, and household insecticides; active pharmaceutical ingredients and intermediates; and products to control infectious diseases. Its Pharmaceuticals segment provides prescription and diagnostic pharmaceuticals. The company's Others segment supplies electric power and steam; designs, constructs, and supervises chemical plants; provides transportation and warehousing services; and conducts physical property and environmental analysis. Sumitomo Chemical Company, Limited was founded in 1913 and is headquartered in Tokyo, Japan.

Syngenta - Syngenta AG, an agriculture company, operates in the crop protection, seeds, professional solutions, and flowers markets worldwide. The company offers selective herbicides under the ACURON, AXIAL, CALARIS, DUAL GLOD, ELUMIS, GESAPRIM, HALEX, and LUMAX brands, as well as non-selective herbicides under the GRAMOXONE, REGLONE, and TOUCHDOWN brand names; and fungicides under the ALADE, AMISTAR, BRAVO, ELATUS, MIRAVIS, MODDUS, PRIORI Xtra, REVUS, RIDOMIL GOLD, SCORE, SWITCH, and TRIVAPRO. It also provides insecticides under the ACTARA, AMPLIGO, ENGEO, FORCE, KARATE, MINECTOT, PROCLAIM, VIRTAKO, VOLIAM, and VERTIMEC brand names; and seed care products under the AVICTA, CRUISER, DIVIDEND, CELEST/MAXIM, FORTENZA, SALTRO, and VIBRANCE brands. In addition, the company offers corn and soybean seeds under the GOLDEN HARVEST, and NK, Nidera brands; field crops under the SYNGENTA seeds name; vegetables under the ROGERS and S&G brand name; and flowers under the SYNGENTA FLOWER brand name. Further, it provides turf and landscape, and professional pest management products; and flower seeds, cuttings, and young plants to professional growers and consumers. The company was founded in 1999 and is headquartered in Basel, Switzerland.

Glossary

AgTech – Short for ‘agricultural technology’, it is a technological industry that is intended for agriculture, to streamline and automate farming processes while improving efficiency.

Amide (or amido) groups – A compound (also known as peptide bonds) where a nitrogen atom is connected to a carbonyl carbon and thereby is either the main or side chain of a protein – either way being the backbone of proteins.

Beta-triketones – Triketones where each ketone functionality is located beta to the other two.

Diamides – A novel chemical class of insecticides that is the most recent with a new Mode of Action (MoA) to come to market. In a chemical sense, it is any compound that contains two amide (or amido) groups (see above for the definition of amide or amido).

Flavesone – a naturally occurring Beta-triketone present in plants.

Flavocide™ – Flavesone synthetically produced by BGT.

Fungicides – Chemicals that destroy fungus.

HPPD – p-Hydroxyphenylpyruvate dioxygenase, an enzyme that catalyses the formation of homogentistic acid, the aromatic precursors of plastoquinone and vitamin E, both of which are important elements for all living things to survive.

Insect Resistance – The technical definition is a heritable change in the susceptibility of a pest population to a particular insecticide, or insecticide group. In more colloquial terms, the ability of insects not to perish as a result of insecticides.

Insecticide – Pesticides used to kill insects.

Insecticide class – Groups of insecticides that share a common (but not identical) chemical structure and mode of action.

Malaria – An intermittent and remittent fever that invades the red blood cells and is transmitted by mosquito bites.

Mode of action – An expression alluding to how insecticides affect pests on a cellular or molecular level.

Neonicotinoids – A class of neuro-active insecticides that are related to nicotine. They were developed by scientists at Shell and Bayer in the 1980s and are among the most used insecticides today, with a 24% market share. They are under high pressure due to their bee toxicity.

Organophosphates – Organophosphorus compounds formed through an (engineered) esterification process involving phosphoric acid and alcohol. It is a commonly used insecticide class.

Pyrethroids – Synthetic derivatives of natural pyrethrins, an organic chemical occurring naturally in chrysanthemum flowers and is toxic to many insects. It is used in many consumer pesticides today.

Qcide™ – BGT’s botanical oil with high amounts of tasmanone, extracted from *Eucalyptus cloeziana* biomass.

Synergy – In general terms, the combination of components or elements to form a connected whole. In the context of BGT’s assets, it alludes to how they can work with existing insecticides to be more effective together than if they were used individually following the principle of 1+1=3.

Tasmanone - a natural compound present in Qcide™ oil that shows evidence of insecticide efficacy.



Yellow Fever – an epidemic-prone mosquito-borne vaccine preventable disease that is transmitted to humans by the bites of infected mosquitoes.

Zika – A mosquito borne disease transmitted from the bites of mosquitoes, particularly the *Aedes aegypti* and *Aedes albopictus* species.

Appendix I – Capital Structure

Class	In millions	% of fully diluted
Ordinary fully paid shares	201.36	96%
Options	8.88	4%
Fully diluted shares	210.24	

Source: Company

Appendix II – Analysts' Qualifications

Stuart Roberts, lead analyst on this report, has been an equities analyst since 2002.

- Stuart obtained a Master of Applied Finance and Investment from the Securities Institute of Australia in 2002. Previously, from the Securities Institute of Australia, he obtained a Certificate of Financial Markets (1994) and a Graduate Diploma in Finance and Investment (1999).
- Stuart joined Southern Cross Equities as an equities analyst in April 2001. From February 2002 to July 2013, his research speciality at Southern Cross Equities and its acquirer, Bell Potter Securities, was Healthcare and Biotechnology. During this time, he covered a variety of established healthcare companies, such as CSL, Cochlear and Resmed, as well as numerous emerging companies. Stuart was a Healthcare and Biotechnology analyst at Baillieu Holst from October 2013 to January 2015.
- After 15 months over 2015–2016 doing Investor Relations for two ASX-listed cancer drug developers, Stuart founded NDF Research in May 2016 to provide issuer-sponsored equity research on ASX-listed Life Sciences companies.
- In July 2016, with Marc Kennis, Stuart co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including Life Sciences companies.
- Since 2018, Stuart has led Pitt Street Research's Resources Sector franchise, spearheading research on both mining and energy companies.

Nick Sundich, lead analyst on this report, is an equities research analyst at Pitt Street Research.

- Nick obtained a Bachelor of Commerce/Bachelor of Arts from the University of Sydney in 2018. He has also completed the CFA Investment Foundations program.
- He joined Pitt Street Research in January 2022. Previously he worked for over three years as a financial journalist at Stockhead.
- While at university, he worked for a handful of corporate advisory firms.

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