Supressing Ember Attack

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Retaining stubble is one of the most important components of a sustainable farming system however, stubble is also a fire risk in southern Australia over the summer.

Figure 1: The pre-emptive flame retardants were applied to standing wheat residue that was harvested with a stripper-front near Balaklava.

A variety of pre-emptive flame-retardants that can be applied weeks or even months in advance of an actual fire are coming to the market.

The aim of this SANTFA demonstration supported by the National Landcare Program was to gauge the impact that pre-emptive flame-retardants with residue efficacy display against ember attack on retained crop stubble. (Figure 1).

METHOD

The trial included three emerging products, each applied at two different rates, a lower rate and a higher rate.

The demonstration was established in the most uniform stubble in the paddock, between a set of wheel lines away from the headland.

All applications were replicated three times to further account for natural variability.

The pre-emptive flame-retardant products are new formulations and no label rates had been established for this type of application.

The lower and higher rates for each product were determined in conjunction with the manufactures for the purpose of this demonstration only and do not represent a recommendation for use.

Each treatment was applied 8 weeks in advance of the burn to test residual effectiveness.

As a control treatment, a series of separate plots were also treated with the pre-emptive flame retardants 1 day in advance of the ember attack simulation. (Table 1)

	Product	Rate	Concentrate (l/ha)	Advanced Application Timing
1	Nil	-	0	-
2	PHOS-CHEK® FORTIFY®	Low	1042	8 weeks
3	PHOS-CHEK® FORTIFY®	High	2083	8 weeks
4	Repela	Low	1250	8 weeks
5	Repela	High	3750	8 weeks
6	Fireout	Low	750	8 weeks
7	Fireout	High	1500	8 weeks
8	Nil	-	0	-
9	PHOS-CHEK® FORTIFY®	Low	1042	1 week
10	PHOS-CHEK® FORTIFY®	High	2083	1 week
11	Repela	Low	1250	1 week
12	Repela	High	3750	1 week
13	Fireout	Low	750	1 week
14	Fireout	High	1500	1 week

Table 1: Pre-emptive Flame-Retardant Treatments.

The actual ember attack simulation was conducted on the 31st of May 2021 with the support of the Department of Environment and Water fire crew from Morialta. (Fig 2)

The temperature was 17°C and the wind was approximately 16km/hr from the north.

Figure 2: The Department of Environment and Water have been a great support.

For obvious safety reasons, this demonstration could not be conducted during the actual fire season. Accordingly, this demonstration provides a relative assessment of the flame retardants only and there is no attempt to directly extrapolate the performance of the flame retardants in this demonstration to the performance that might be exhibited on a catastrophic fire danger day with greater ambient temperature and higher wind speeds.

To simulate the ember attack, firelighter was lit and dropped onto the up-wind side of each plot. (Fig 3).

The duration for the fire to catch and spread across the 2-meter plot was timed and recorded on video.

RESULTS

There was a clear difference in the intensity and transmission rate of the fire follow in the ember attack that correlated strongly to the applied rate of flame retardants.
(Fig 4 a - d).

Figure 3: The ember attack was simulated by dropping a lit firelighter onto the up-wind side of every demonstration plot.

Figure 4a: The difference in the fire transmission rate between the best performing treatments and the Nil treatments was easy to see. (Nil above, Best below).

Figure 4b: Poor suppression. Plots that burned with the most intense fire resulted in the formation of char and ash. The presence of the white and grey ash is evidence complete combustion.

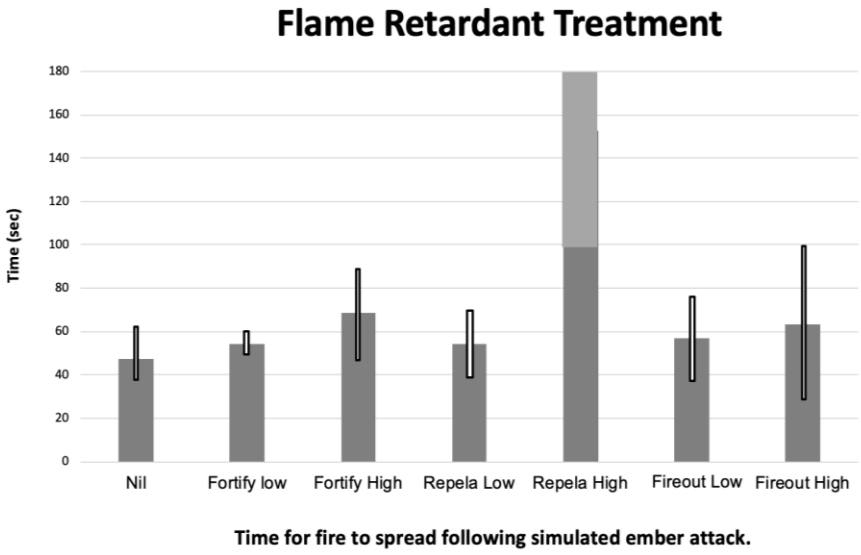
Figure 4c: Moderate suppression. Plot with a lot of char but very little ash correlated to a slower spread and less intense burn. In some cases, the fire did not consume all the straw in the plot.

Figure 4d: Good suppression. For some of the higher rate treatments, the fire lighter only burnt the straw immediately around it and the fire did not spread across the plot.

The transmission rate of the fire across all plots were recorded and analysed. Ultimately, when the outcomes of PHOS-CHEK® FORTIFY®, Repela and Fireout are considered directly against the rate of active ingredient applied, it seems that all three products perform similarly. (Table 2)

Of course, adding more active ingredient adds more cost.

At this stage, the commercial cost and availability of these emerging products is not fully understood however, the active ingredients are likely to be experiencing supply chain and price volatility similar to fertilisers.



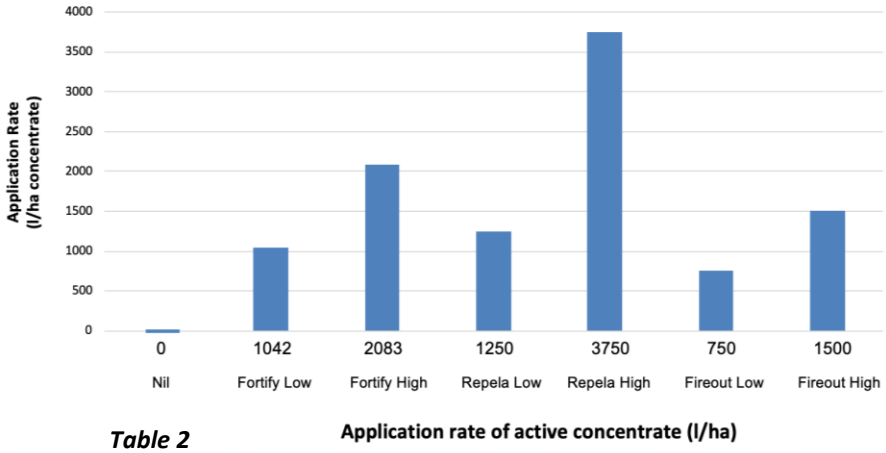


Table 2

So, it's going to be relatively expensive to use over large areas and the most likely use in broad acre farming systems is not for whole of paddock application.

Rather, a targeted application as a component in a holistic 'stay and defend plan' may be worth considering.

For example, treating a strip of paddock on the north side of an asset such as a house.

In this scenario, controlling ember attacks flying in on north winds may help to suppress spot fires forming behind fire fighters fighting the main fire front.

All three flame retardants are halogen free. PHOS-CHEK® FORTIFY® and FireOut are ammonium-phosphate flame retardants. Repela is an intumescent fire retardant that does not contain Phosphorus.

SPECIAL THANKS

Callum March of Richmond Park for hosting the trial and supplying equipment.

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The suppliers of flame retardants including PHOS-CHEK® FORTIFY®, Repela and Fireout.

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