# Risks and Rewards of Very Early Sown Canola

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**Key Messages**

- Sowing canola in March resulted in no yield penalty, unlike sowing in May, which had significantly lower yields ($P < 0.05$).
- While March sowing led to significantly lower plant densities ($P < 0.05$), this did not translate into reduced yields, highlighting the crops' ability to compensate.
- Earlier sowing emphasises phenological differences of varieties vernalisation requirements influencing peak flowering periods.

**Aim**

To understand the risks and rewards of sowing canola early, in particular, the risks associated with March sowing and how it impacts crop establishment, growth and yield.

**Background**

This is the third year of the project, with the previous two seasons providing early seeding opportunities off the back of tropical systems. Despite the stark contrast between the 2022 and 2023 seasons, both trials consistently showed that the early April sowing outperformed the early May sowing treatments. These trials have demonstrated the advantages of sowing canola early, prompting this year's trial to further explore the risks.

This year's trial pushed the boundaries of conventional sowing times by sowing the first round of canola on March 20th. When forecasted rain did not materialise, the trial was irrigated with 10mm, enabling some seed to germinate, and providing a basis to evaluate the risks of March sowing. The subsequent treatments were sown on the 11th of April and the 9th of May, with each time of sowing treatment containing four canola varieties of varying maturity lengths; Emu, 44Y27, 4520P and Regiment. A second round of irrigation, 20mm, occurred on the 22nd of April, as again, forecast rain dissipated. In total (without irrigation), the site received 231.25mm for the growing season, and 330.60mm of rain for the year.

**Trial Details**

| | |
|---|---|
| **Trial location** | Elserae Agriculture, Maya |
| **Plot size & replication** | 10m x 1.75m x 3 replications |
| **Soil type** | Deep yellow sand |
| **Paddock rotation** | 2023 – fallow, 2022 – wheat, 2021 - lupins |
| **Sowing date** | Time of sowing 1: 20/03/2024, Time of sowing 2: 11/04/2024, Time of sowing 3: 09/05/2024 |
| **Sowing rate** | 2 kg/ha Emu, 4 kg/ha 44Y27, 3.9 kg/ha 4520P, 3.5 kg/ha Regiment (based on seeds/kg) |
| **Irrigation** | 10mm on 27/03/2024, 20mm on 22/04/2024 |
| **Growing season rainfall** | 231mm |
| **Fertiliser** | Pre-sowing: 130 kg/ha MacroPro Extra (+ Impact) and 100 kg/ha urea<br>05/06/2024 - 30 L/ha UAN<br>09/07/2024 - 100 L/ha UAN |
| **Herbicides, insecticides & fungicides** | Pre-ems: 1.5 L/ha glyphosate, 1.2 L/ha propyzamide, 100 g/ha clopyralid, 1 L/ha chlorpyrifos, 100 ml/ha bifenthrin<br>05/06/2024 - 500 ml/ha chlorpyrifos<br>19/06/2024 - 400 ml/ha emamectin<br>26/07/2024 – 200 ml/ha spinetoram<br>15/08/2024 - 60 g/ha sulfoxaflor, 600 ml/ha [75 g/L bixafen + 150 g/L prothioconazole], 300 ml/ha emamectin<br>25/09/2024 - 60 g/ha sulfoxaflor, 300 ml/ha emamectin |
| **Harvest date** | 24/10/2024 |

**Treatments**

| | Time of Sowing Treatments |
|---|---|
| TOS 1 | March 20th |
| TOS 2 | April 11th |
| TOS 3 | May 9th |

| Varieties | Maturity Rate |
|---|---|
| Emu | 3 |
| 44Y27 | 4 |
| 4520P | 4.5 |
| Regiment | 5 |

## Soil Composition

| Depth (cm) | pH ($CaCl_2$) | Col P (mg/kg) | Col K (mg/kg) | S (mg/kg) | N ($NO_3$) (mg/kg) | N ($NH_4$) (mg/kg) | EC (ds/m) | OC (%) |
|---|---|---|---|---|---|---|---|---|
| 0-10 | 5.5 | 40 | 57 | 28.2 | 30 | 2 | 0.164 | 0.83 |
| 10-20 | 5.3 | 20 | 48 | 18.2 | 8 | 2 | 0.057 | 0.40 |
| 20-30 | 4.7 | 5 | 34 | 39.2 | 63 | 2 | 0.053 | 0.20 |

## Site Weather Data

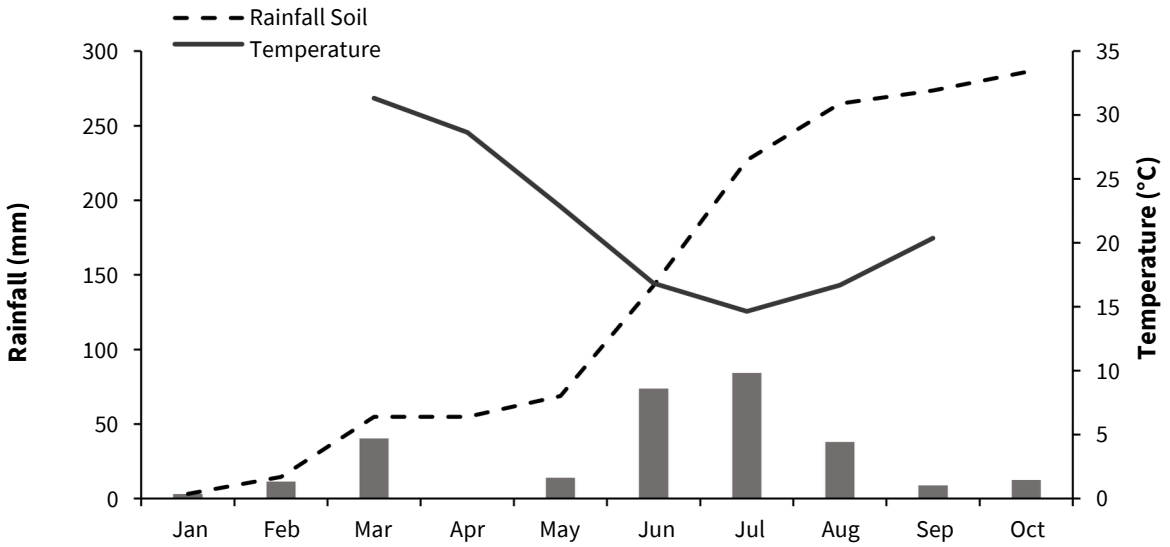


**Figure 1.** Monthly rainfall (mm) for 2024 at the main trial site in Maya (grey columns), with the accumulated rainfall indicated by the dotted line. Monthly average max soil temperature (°C) data at the trial from March to August (solid black line).

## Results

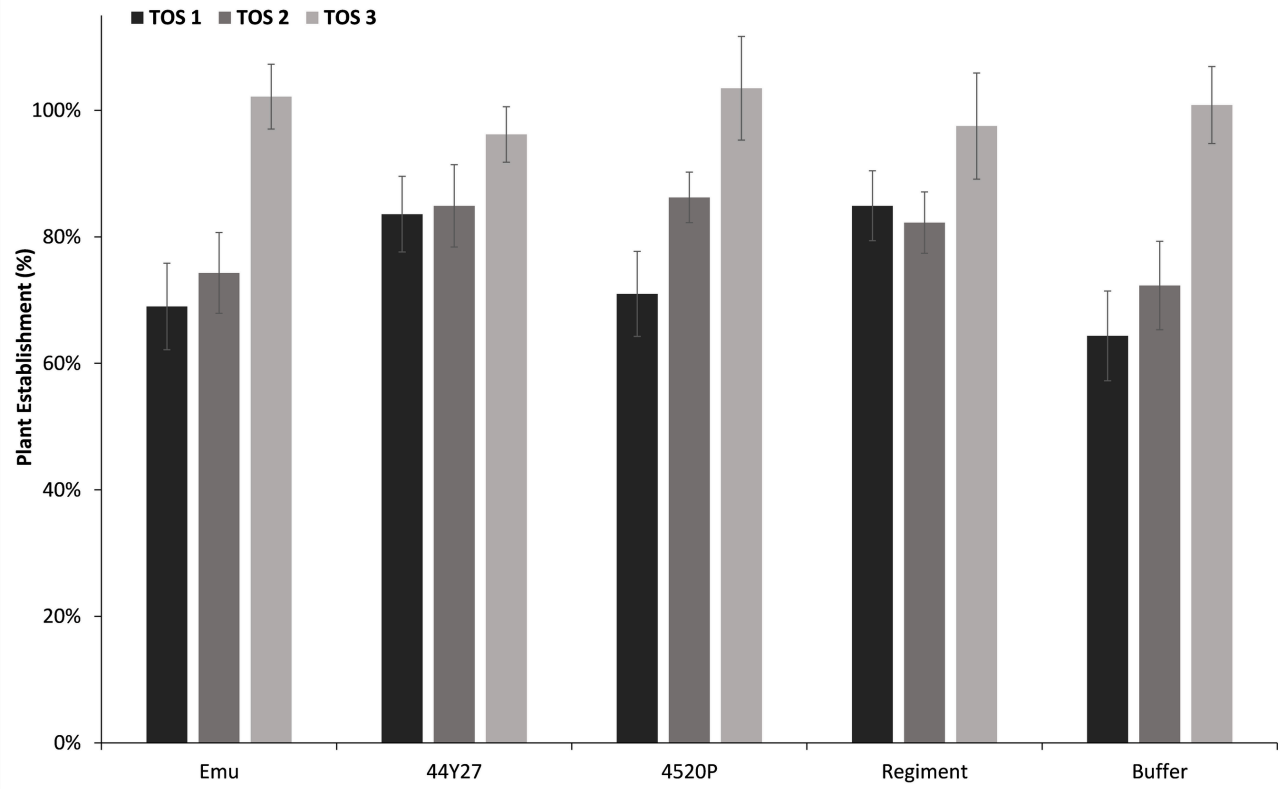


**Figure 2**. Percentage of plants established 6 weeks after sowing for each variety for the various time of sowing treatments: time of sowing 1 (black), time of sowing 2 (dark grey) and time of sowing 3 (light grey). The target density for this trial was 40 plants/$m^2$, with seeding rates adjusted to allow for germination and establishment issues, therefore full establishment (100%) equated to 67 plants/$m^2$.

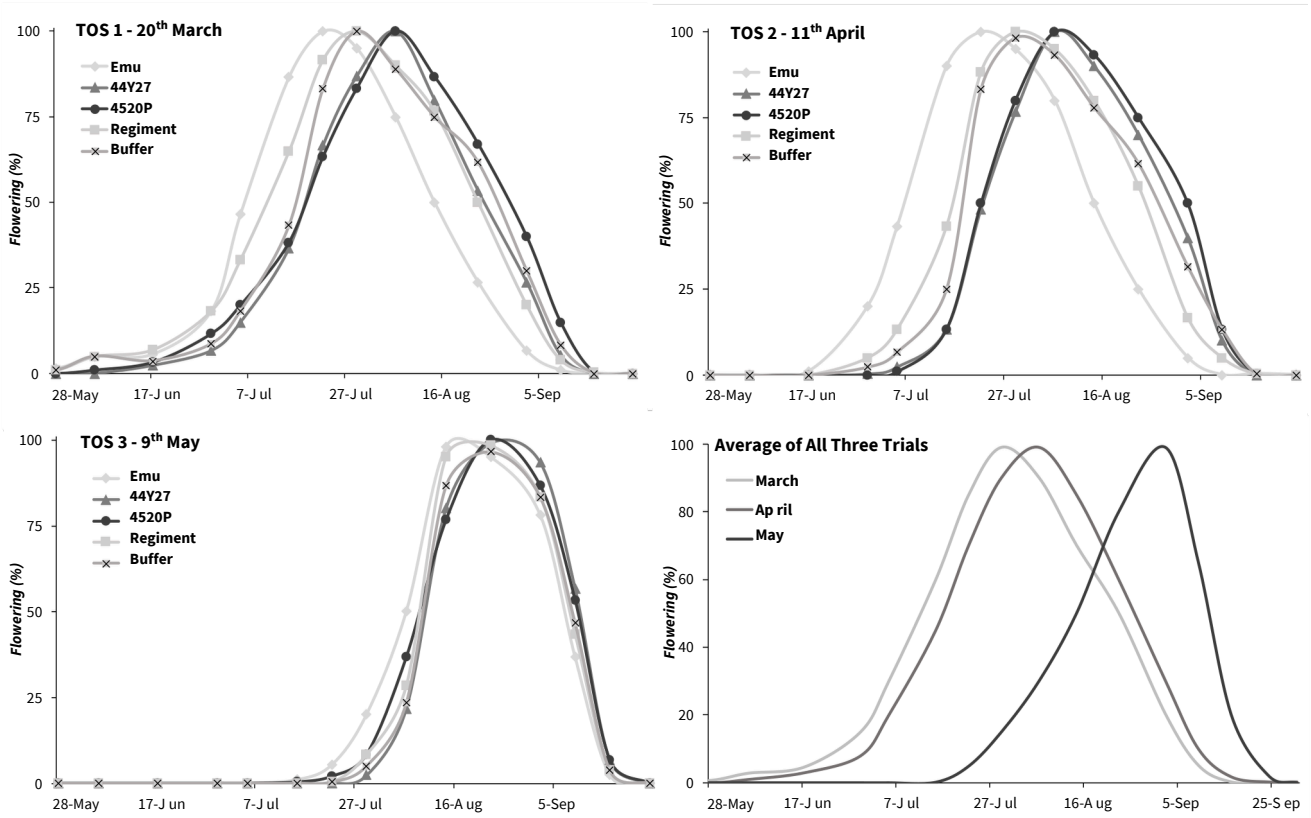


**Figure 3.** The percentage of flowering plants for all three time of sowing treatments. Top left is time of sowing 1 (20th of March), top right is time of sowing 2 (11th of April), bottom left is time of sowing 3 (9thof May) and bottom right is the average of all varieties from all three years of the trial (except for March which contains only 2024 data).

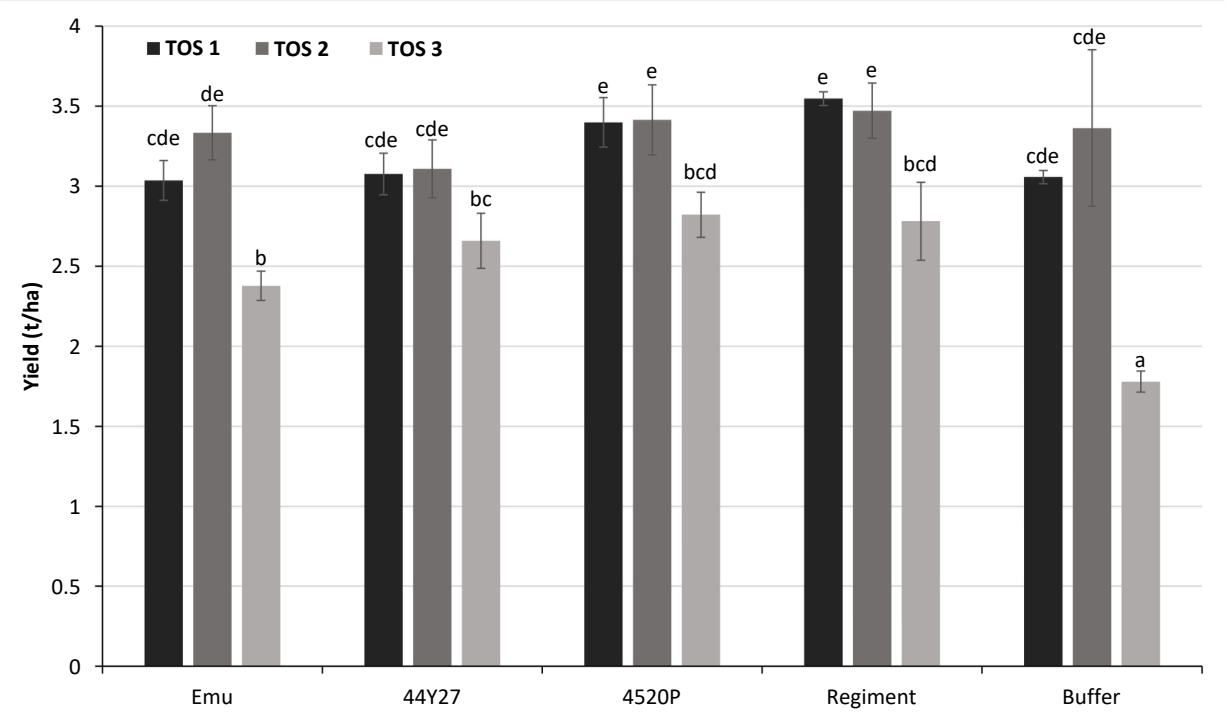


**Figure 4.** The average yield (tonnes/hectare) for each variety in each time of sowing treatment. Time of sowing 1 is the black bars, time of sowing 2 is the dark grey bars and time of sowing 3 is the light grey bars. Letters signify significant differences.

**Table 1**.Grain quality results for each variety in all time of sowing treatments, including protein, oil, yield (t/ha) and large admix (%).

| Variety | Yield (t/ha) | | | Oil | | | Protein | | | Large Admix | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOS1 | TOS2 | TOS3 | TOS1 | TOS2 | TOS3 | TOS1 | TOS2 | TOS3 | TOS1 | TOS2 | TOS3 |
| Emu | 3.16 | 3.33 | 2.38 | 46.80 | 47.37 | 46.90 | 20.80 | 21.3 | 21.93 | 0.52 | 0.40 | 0.75 |
| 44Y27 | 3.08 | 3.11 | 2.66 | 46.30 | 45.63 | 46.57 | 20.43 | 21.5 | 21.2 | 0.30 | 0.28 | 0.28 |
| 4520P | 3.40 | 3.41 | 2.82 | 45.70 | 44.90 | 45.10 | 20.97 | 21.37 | 21.37 | 0.53 | 0.27 | 0.42 |
| Regiment | 3.55 | 3.47 | 2.78 | 48.00 | 47.93 | 47.97 | 20.47 | 21.1 | 20.97 | 0.19 | 0.40 | 0.32 |
| Buffer | 3.06 | 3.36 | 1.78 | 47.80 | 47.13 | 46.70 | 20.83 | 21.13 | 21.55 | 0.31 | 0.45 | 0.61 |

**Comments**

***Establishment Rates***

Seeding conditions are a major factor in canola establishment with wetter conditions generally improving establishment (expected 80%) (DPIRD 2019). When sown dry with a marginal season break the expected establishment is anywhere from 20-45% (DPIRD 2019). For TOS 1 the initial germination was on average 6%, however six weeks after sowing (6WAS), following 34mm of rain (20mm was irrigated), that rate increased to 75% (Figure 2). The initial low germination was due to sowing under hot, dry conditions on the 20th of March, with average daily maximum soil temperatures of 31.3°C (Figure 1). The recovery of TOS 1 plots suggests that the environmental conditions, including multiple days exceeding 34°C, combined with the initial 10mm irrigation did not cause excessive seed mortality in TOS 1. Additionally, the plants that germinated in March, survived the hot, dry conditions, and were the first to flower and begin podding.

TOS 2 was dry sown on the 11th of April with average soil temperatures of 29°C (Figure 1), and on the 22nd of April, the site was irrigated with 20mm. The expected establishment for these conditions would be around 60% (DPIRD 2019), however, the actual average establishment rate 6WAS was 80%. TOS 3 was sown into more reasonable conditions, with soil moisture present and soil temperatures of 23°C, giving it an expected establishment rate of 65% (DPIRD 2019). The average establishment rate for all varieties was 100%, showing that these were the best sowing conditions.

All treatments exceeded their establishment expectations, however, the difference in rates between the time of sowing treatments can be attributed to the factors of water availability and soil temperature at seeding. Therefore, if sowing early and in hot, dry conditions, seeding rates may need to be adjusted as establishment rates are poorer.

***Flowering***

Across all three years of the trials, canola sown in early April began flowering quicker than the canola sown in May, relative to their sowing dates (Figure 3). The earlier sown canola, on average, had an extended flowering period of five and a half weeks. This year both TOS 1 and TOS 2 started flowering approximately two months after germinating, and then flowered for 12 and 10 weeks respectively. Whereas TOS 3 started flowering two and a half months after germinating and flowered for seven weeks. This outcome aligns with expectations, as later sowing dates coincide with cooler temperatures, which delays plants in accumulating the required degree days to switch from a vegetative state to a reproductive stage.

Earlier sown canola emphasises the phenological variations of the different vernalisation thresholds of varieties. When sown early, straight thermal varieties begin flowering sooner than those with vernalisation requirements. This is because they quickly accumulate the required degree days in warmer early Autumn conditions. Consequently, varieties that require a certain number of cooler days to meet their vernalisation requirements are delayed. This trend has been evident in the previous two trials and was again seen this year, with TOS 1 and TOS 2 demonstrating three distinct peak flowering times corresponding to a variety's maturity length (Figure 3). In contrast, under TOS 3 conditions, all varieties reached peak flowering simultaneously, regardless of maturity rating.

In the earlier sown canola treatments, Emu, which is an early maturing variety (3), was the first to reach peak flowering, followed by Regiment a week later, and then 44Y27 and 4520P two weeks later. Interestingly, Regiment, which is classified as a mid-maturing variety (5) in DPIRD's 2024 Sowing Guide (DPIRD 2023), was observed to behave similar to an early-mid maturing variety, and has an apparent lower vernalisation requirement than 44Y27 and 4520P, which have a '4' and '4.5' maturity rating, respectively (Figure 3).

All these phenological observations are critical for optimising sowing strategies and ensuring that flowering aligns with favourable environmental conditions to maximise resource efficiency and potential yields. Additionally, understanding each variety's phenological characteristics when sowing at different times enables growers to diversify their frost risk. By strategically varying sowing dates and varieties, peak flowering of canola paddocks

can occur over a broader time frame, reducing the likelihood of widespread yield losses from a single frost event and therefore enhancing overall farm productivity.

***Yield and Grain Quality***

Consistent with the previous two trials; canola sown in April outperformed canola sown in May ($P < 0.05$) (Figure 4). The only variety that was not statistically significant between all three time of sowing treatments was 44Y27 ($P > 0.05$). The yields of all the other varieties from both TOS 1 and TOS 2 were significantly higher than their TOS 3 counterparts.

The results showed no statistical difference in yield within and between all varieties in TOS 1 and TOS 2 treatments ($P > 0.05$). This indicates that there were no detrimental impacts on crop performance when sown in March, however, it also provided no yield advantage. Time of sowing 1 had a significantly lower establishment compared to TOS 2, indicating that the TOS 1 plants were able to compensate for the lower plant densities. This also shows that the initial germinates of TOS 1 in March did not significantly increase yield. This highlights the importance of achieving better initial germination rates to enhance early crop establishment and increase crop yield.

Overall, TOS 1 Regiment was the highest yielding treatment with 3.55 t/ha, closely followed by its TOS 2 counterpart with 3.47 t/ha. The next highest yielding treatments were TOS 2 4520P with 3.41 t/ha and then TOS 1 4520P with 3.40 t/ha. In terms of grain quality, TOS 1 had significantly less protein than TOS 2 and 3 ($P < 0.05$) (Table 1). There were no differences in oil and admix (%) between all the treatments.

***Insects***

Throughout the year, observations on insect numbers and damage were recorded. The earlier sown plots, TOS 1, faced increased insect pressure, potentially due to being the only green vegetation in the vicinity. The insect pressure persisted throughout the season, requiring five insecticide applications to manage the infestations – a challenge consistent with growers this year. This highlights the importance of effective pest management strategies, especially for early sown crops, to minimise damage and protect yield potential. It should also be noted that there was some bird damage at the trial, particularly to two Emu plots, one in TOS 1 and one in TOS 2.

**Conclusion**

The findings from three years of this trial have demonstrated the benefits of early sown canola, showing that seeding earlier than the traditional early-May window can lead to increased yields across various seasonal conditions. This strategic adjustment can also help mitigate potential yield losses caused by frost events and terminal drought, whilst taking advantage of optimal temperature and moisture conditions. However, these trials have also shown the importance of a successful initial germination. Improved early establishment could further enhance crop vigour and lead to higher yields in early sowing scenarios, making the strategy more effective and reliable. Further research to improve early establishment could focus on the impact of sowing depth, seed size and stubble loads.

**References**

DPIRD. 2019. "Tactical Break Crop Agronomy Project: Canola and Pulse Agronomy Trials and Information." Department of Primary Industries and Regional Development.
DPIRD. 2023. 2024 Western Australian Crop Sowing Guide. Perth: Government of Western Australia.

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**Peer Review**

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