In Vitro Aphid Choice UV

Contents

Load Libraries

```
pacman::p_load(ggplot2, readxl, ggbeeswarm, readr, dplyr, tidyr, tidyverse, devtools,
    cowplot, knitr, emmeans, lme4, lmerTest, RColorBrewer, viridis, install = FALSE)
```

Load Data

```
aphid_choice_raw <- read_excel("data/alate_choice_in_vitro.xlsx") %>%
    mutate(block = as.factor(block))
```

Summarize aphid counts

```
aphid_choice_sum <- aphid_choice_raw %>%
    group_by(block, treatment, plate, UV) %>%
    summarize(total_alates_4_hrs = sum(alates_4_hrs), total_nymphs_4_hrs = sum(nymphs_4_hrs),
        total_alates_24_hrs = sum(alates_24_hrs), total_nymphs_24_hrs = sum(nymphs_24_hrs),
        .groups = "drop")

# reshape

aphid_choice_sum <- aphid_choice_sum %>%
    pivot_wider(names_from = treatment, values_from = c(total_alates_4_hrs, total_nymphs_4_hrs,
```

```
            total_alates_24_hrs, total_nymphs_24_hrs), names_glue = "{.value}_{treatment}") %>%
        select(block, plate, UV, alates_220_supernatant_4_hrs = total_alates_4_hrs_220_supernatant,
            alates_PPM_4_hrs = total_alates_4_hrs_PPM, nymphs_220_supernatant_4_hrs = total_nymphs_4_hrs_220
            nymphs_PPM_4_hrs = total_nymphs_4_hrs_PPM, alates_220_supernatant_24_hrs = total_alates_24_hrs_2
            alates_PPM_24_hrs = total_alates_24_hrs_PPM, nymphs_220_supernatant_24_hrs = total_nymphs_24_hrs
            nymphs_PPM_24_hrs = total_nymphs_24_hrs_PPM) %>%
        mutate(sum_alates_4_hrs = alates_220_supernatant_4_hrs + alates_PPM_4_hrs, sum_nymphs_4_hrs = nymph
            nymphs_PPM_4_hrs, sum_alates_24_hrs = alates_220_supernatant_24_hrs + alates_PPM_24_hrs,
            sum_nymphs_24_hrs = nymphs_220_supernatant_24_hrs + nymphs_PPM_24_hrs, total_alates_10_or_more =
                10, "yes", "no")) %>%
        filter(sum_alates_4_hrs >= 5)
```

Calculate percent aphid counts and deviations from 50%

```
# separate by plate calculate percents
aphid_choice_percent_plate <- aphid_choice_sum %>%
    group_by(block, plate, UV, total_alates_10_or_more) %>%
    summarize(percent_choice_4hrs = (100 * (alates_220_supernatant_4_hrs/sum_alates_4_hrs)),
        percent_choice_24hrs = (100 * (alates_220_supernatant_24_hrs/sum_alates_24_hrs)),
        percent_nymphs_4hrs = (100 * (nymphs_220_supernatant_4_hrs/sum_nymphs_4_hrs)),
        percent_nymphs_24hrs = (100 * (nymphs_220_supernatant_24_hrs/sum_nymphs_24_hrs)),
        ) %>%
    mutate(percent_diff_from_50_4hrs = percent_choice_4hrs - 50, percent_diff_from_50_24hrs = percent_ch
        50  # Calculate the difference from 50%
)
```

```
## `summarise()` has grouped output by 'block', 'plate', 'UV'. You can override
## using the `.groups` argument.
```

```
# Calculate the mean for UV and no UV groups
aphid_choice_mean <- aphid_choice_percent_plate %>%
    group_by(UV) %>%
    summarise(mean_percent_diff_from_50_4hrs = mean(percent_diff_from_50_4hrs, na.rm = TRUE),
        mean_percent_diff_from_50_24hrs = mean(percent_diff_from_50_24hrs, na.rm = TRUE)) %>%
    ungroup()
```

Plots

4 Hour Alate Choice

```
# remove block 1
aphid_choice_percent_plate_no_block1 <- aphid_choice_percent_plate %>%
  filter(block != "1")

#plot it!
ggplot(aphid_choice_percent_plate_no_block1, aes(x = block, y = percent_diff_from_50_4hrs, fill = UV, g
  geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +  # Dodge bars by both p
  scale_y_continuous(limits = c(-50, 50),  # Set y-axis from -50% to +50% (around 50%)
```

```
                        breaks = seq(-50, 50, 10),  # Customize y-axis breaks
                        labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +  #
    coord_flip() +  # Flip coordinates so the bars are horizontal
    theme_minimal() +  # Use minimal theme
    labs(x = "Block",
         y = "% of Alates Choosing #220",
         title = "Aphid Preference for #220 Supernatant at 4 Hours") +
    geom_hline(yintercept = 0, color = "white", alpha = 0) +  # Add a horizontal line at 50%
    theme(axis.text.x = element_text(angle = 45, hjust = 1),  # Rotate x-axis text for better readability
          legend.position = "bottom") + # Place legend at the bottom
    # Add dotted lines between different block groups
    geom_vline(xintercept = seq(1.5, length(unique(aphid_choice_percent_plate_no_block1$block)) - 0.5, by
               linetype = "dotted", color = "grey", size = 0.5)  # Dotted lines between blocks
```
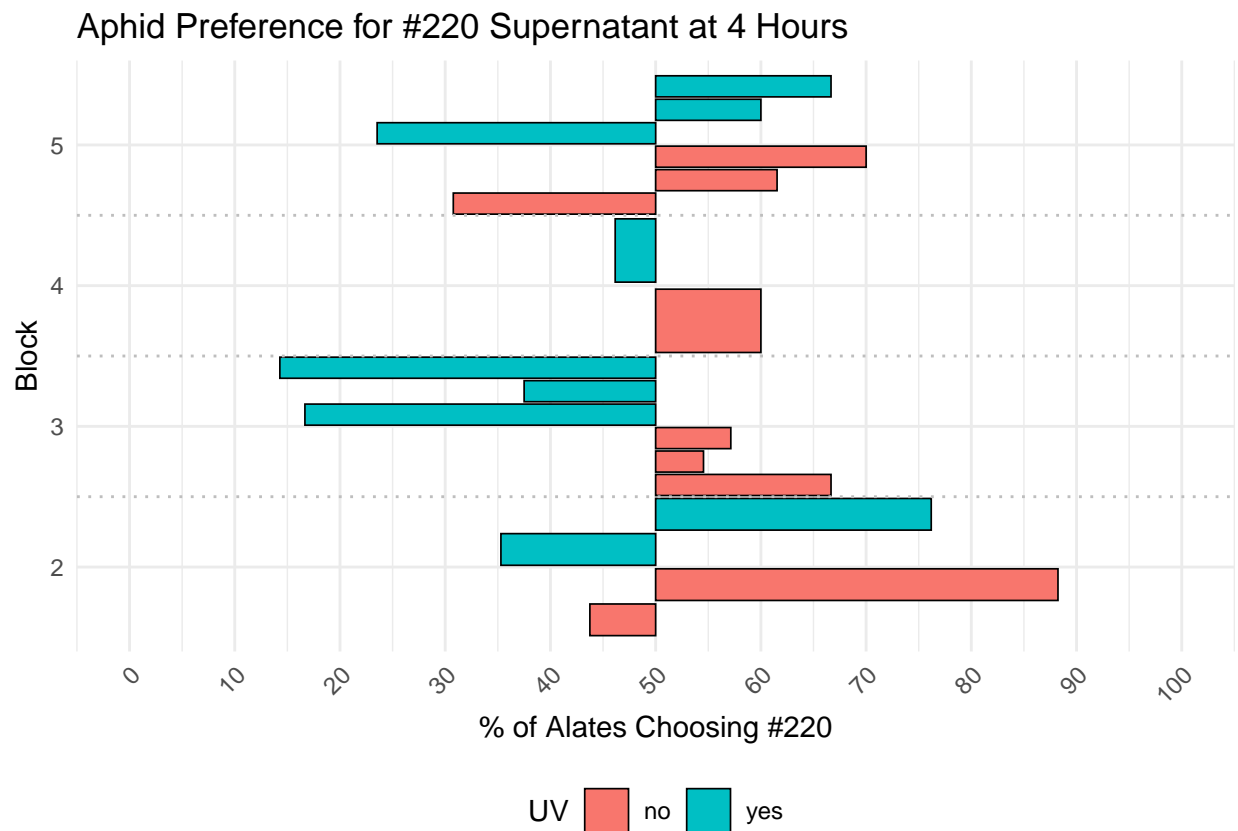
```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```


Aphid Preference for #220 Supernatant at 4 Hours

```
#-------------------------------------------------

#rearrange so all UV is grouped
ggplot(aphid_choice_percent_plate_no_block1, aes(x = interaction(block, UV), y = percent_diff_from_50_4H
```
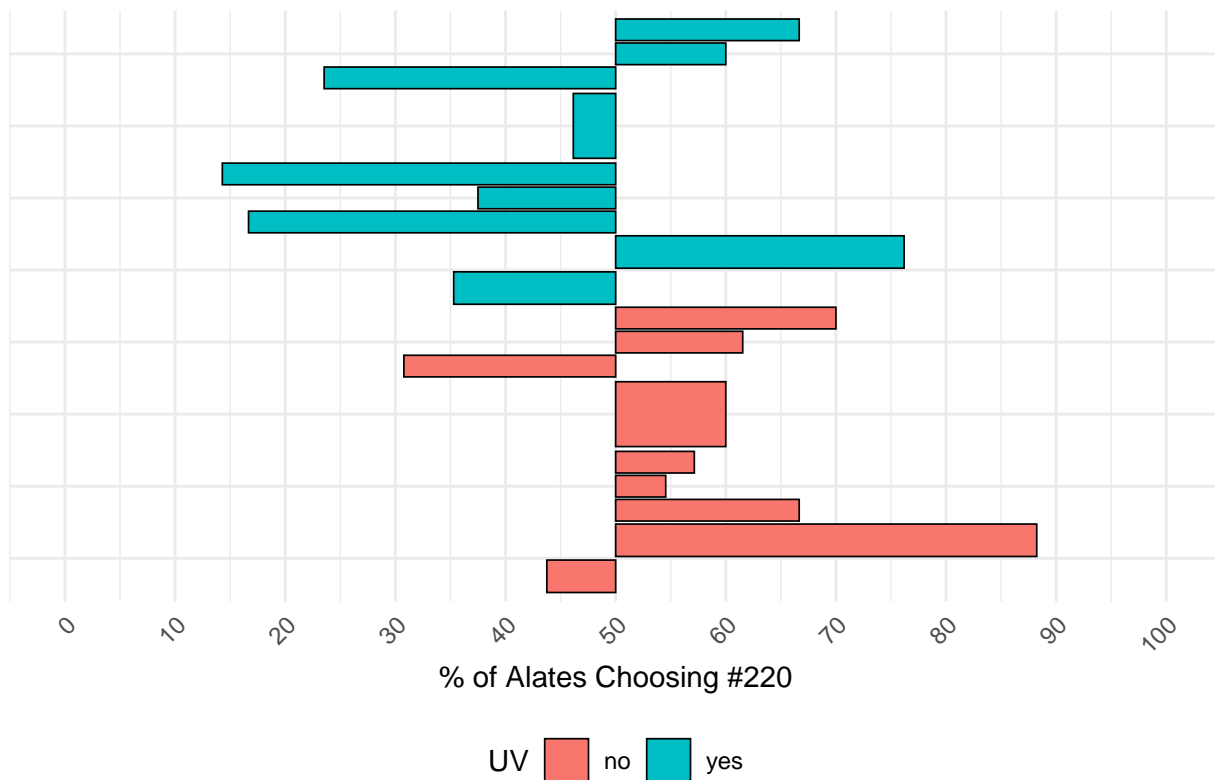
```
geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +  # Dodge bars by both p
scale_y_continuous(limits = c(-50, 50),  # Set y-axis from -50% to +50% (around 50%)
                   breaks = seq(-50, 50, 10),  # Customize y-axis breaks
                   labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +  #
coord_flip() +  # Flip coordinates so the bars are horizontal
theme_minimal() +  # Use minimal theme
labs(x = NULL,
     y = "% of Alates Choosing #220",
     title = "Aphid Preference for #220 Supernatant at 4 Hours") +
geom_hline(yintercept = 0, color = "white", alpha = 0) +  # Add a horizontal line at 50%
theme(axis.text.x = element_text(angle = 45, hjust = 1),  # Rotate x-axis text for better readability
      axis.text.y = element_blank(),  # Remove y-axis labels
      legend.position = "bottom",  # Place legend at the bottom
      axis.ticks.x = element_blank()) # Remove x-axis ticks for a cleaner look
```

Aphid Preference for #220 Supernatant at 4 Hours

% of Alates Choosing #220

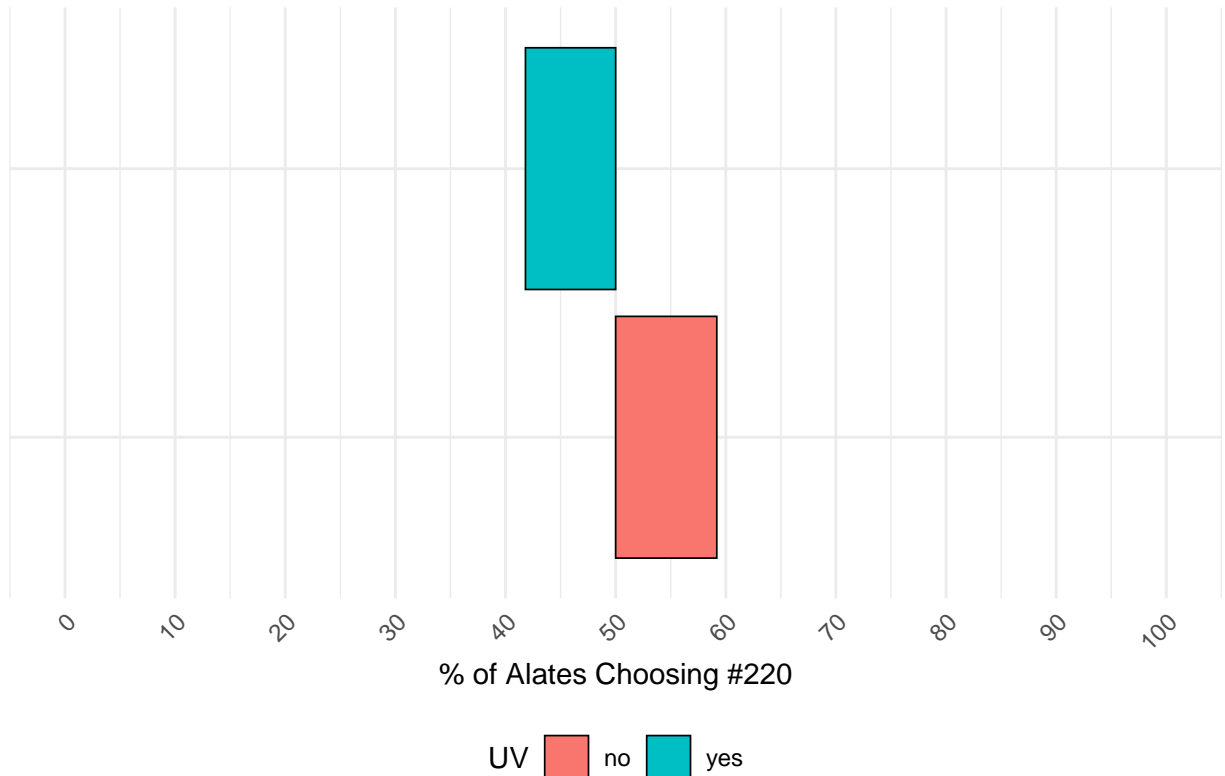UV   no   yes

```
#-----------------------------------------------

# average across UV/no UV
ggplot(aphid_choice_mean, aes(x = UV, y = mean_percent_diff_from_50_4hrs, fill = UV)) +
  geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +  # Dodge bars by both p
  scale_y_continuous(limits = c(-50, 50),  # Set y-axis from -50% to +50% (around 50%)
                     breaks = seq(-50, 50, 10),  # Customize y-axis breaks
                     labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +  #
  coord_flip() +  # Flip coordinates so the bars are horizontal
  theme_minimal() +  # Use minimal theme
```

```
labs(x = NULL,
     y = "% of Alates Choosing #220",
     title = "MEAN Aphid Preference for #220 Supernatant at 4 Hours") +
geom_hline(yintercept = 0, color = "white", alpha = 0) +  # Add a horizontal line at 50%
theme(axis.text.x = element_text(angle = 45, hjust = 1),  # Rotate x-axis text for better readability
      axis.text.y = element_blank(),  # Remove y-axis labels
      legend.position = "bottom",  # Place legend at the bottom
      axis.ticks.x = element_blank())  # Remove x-axis ticks for a cleaner look
```

MEAN Aphid Preference for #220 Supernatant at 4 Hours

% of Alates Choosing #220

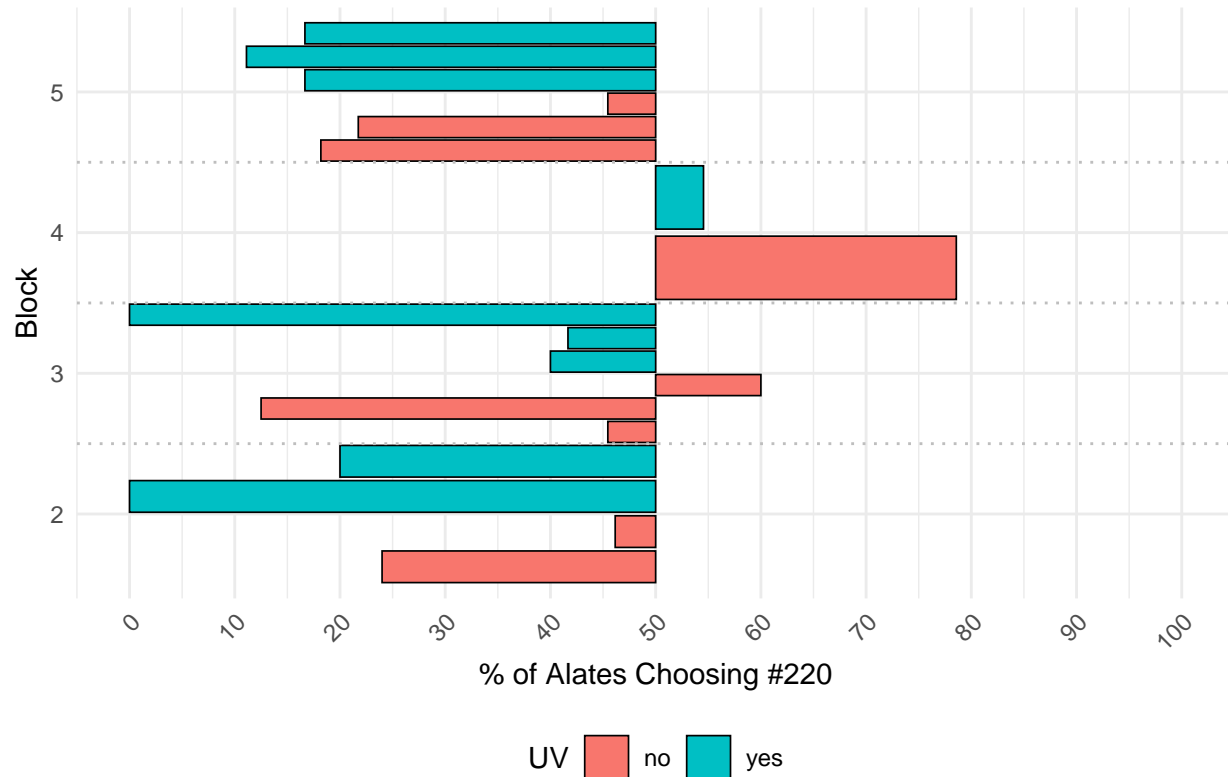UV no yes

24 Hour Alate Choice

```
#plot it!
ggplot(aphid_choice_percent_plate, aes(x = block, y = percent_diff_from_50_24hrs, fill = UV, group = in
  geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +  # Dodge bars by both p
  scale_y_continuous(limits = c(-50, 50),  # Set y-axis from -50% to +50% (around 50%)
                     breaks = seq(-50, 50, 10),  # Customize y-axis breaks
                     labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +  #
  coord_flip() +  # Flip coordinates so the bars are horizontal
  theme_minimal() +  # Use minimal theme
  labs(x = "Block",
       y = "% of Alates Choosing #220",
       title = "Aphid Preference for #220 Supernatant at 24 Hours") +
  geom_hline(yintercept = 0, color = "white", alpha = 0) +  # Add a horizontal line at 50%
```

```
theme(axis.text.x = element_text(angle = 45, hjust = 1),  # Rotate x-axis text for better readability
      legend.position = "bottom") + # Place legend at the bottom
# Add dotted lines between different block groups
geom_vline(xintercept = seq(1.5, length(unique(aphid_choice_percent_plate_no_block1$block)) - 0.5, by
           linetype = "dotted", color = "grey", size = 0.5)  # Dotted lines between blocks
```

Aphid Preference for #220 Supernatant at 24 Hours

% of Alates Choosing #220

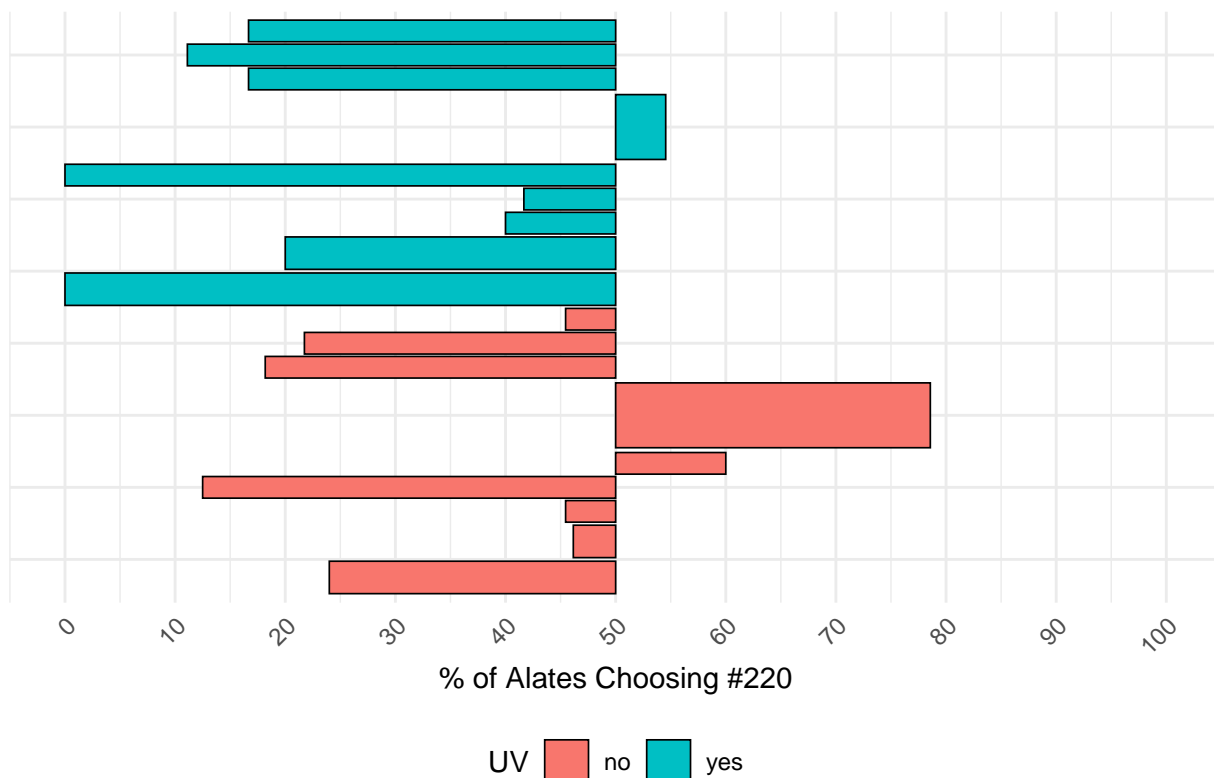UV no yes

```
#------------------------------------------------

#rearrange so all UV is grouped
ggplot(aphid_choice_percent_plate, aes(x = interaction(block, UV), y = percent_diff_from_50_24hrs, fill
  geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +  # Dodge bars by both p
  scale_y_continuous(limits = c(-50, 50),  # Set y-axis from -50% to +50% (around 50%)
                     breaks = seq(-50, 50, 10),  # Customize y-axis breaks
                     labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +  #
  coord_flip() +  # Flip coordinates so the bars are horizontal
  theme_minimal() +  # Use minimal theme
  labs(x = NULL,
       y = "% of Alates Choosing #220",
       title = "Aphid Preference for #220 Supernatant at 24 Hours") +
  geom_hline(yintercept = 0, color = "white", alpha = 0) +  # Add a horizontal line at 50%
  theme(axis.text.x = element_text(angle = 45, hjust = 1),  # Rotate x-axis text for better readability
        axis.text.y = element_blank(),  # Remove y-axis labels
        legend.position = "bottom",  # Place legend at the bottom
        axis.ticks.x = element_blank()) # Remove x-axis ticks for a cleaner look
```

Aphid Preference for #220 Supernatant at 24 Hours

% of Alates Choosing #220

UV ☐ no ☐ yes

```
#------------------------------------------------
# average across UV/no UV
ggplot(aphid_choice_mean, aes(x = UV, y = mean_percent_diff_from_50_24hrs, fill = UV)) +
  geom_col(position = position_dodge(width = 1), color = "black", size = 0.3) +   # Dodge bars by both p
  scale_y_continuous(limits = c(-50, 50),   # Set y-axis from -50% to +50% (around 50%)
                     breaks = seq(-50, 50, 10),   # Customize y-axis breaks
                     labels = c("0", "10", "20", "30", "40", "50", "60", "70", "80", "90", "100")) +   #
  coord_flip() +   # Flip coordinates so the bars are horizontal
  theme_minimal() +   # Use minimal theme
  labs(x = NULL,
       y = "% of Alates Choosing #220",
       title = "MEAN Aphid Preference for #220 Supernatant at 24 Hours") +
  geom_hline(yintercept = 0, color = "white", alpha = 0) +   # Add a horizontal line at 50%
  theme(axis.text.x = element_text(angle = 45, hjust = 1),   # Rotate x-axis text for better readability
        axis.text.y = element_blank(),   # Remove y-axis labels
        legend.position = "bottom",   # Place legend at the bottom
        axis.ticks.x = element_blank())   # Remove x-axis ticks for a cleaner look
```

MEAN Aphid Preference for #220 Supernatant at 24 Hours

% of Alates Choosing #220

UV no yes