UNIVERSITY OF SASKATCHEWAN

VEGETABLE CULTIVAR AND CULTURAL TRIALS 2001

PREPARED BY:
D. WATERER
J. BANTLE
K. LERAY

FUNDED BY:
AGRICULTURE DEVELOPMENT FUND &
AGRI-FOOD INNOVATION FUND

Department of Plant Sciences
University of Saskatchewan, 51 Campus Drive
Saskatoon, Saskatchewan, Canada, S7N 5A8
Telephone: (306) 966-5855 Fax: (306) 966-5015
E-mail: waterer@sask.usask.ca jmb127@duke.usask.ca

Saskatchewan Agriculture and Food

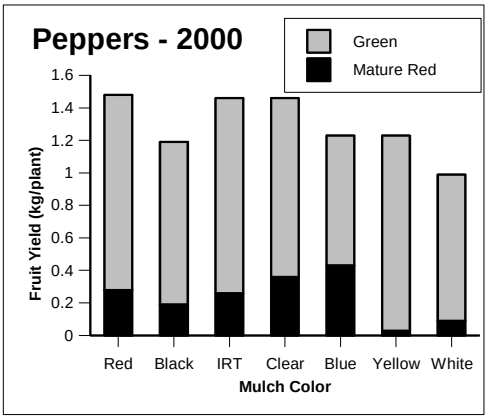
AGRI-FOOD INNOVATION

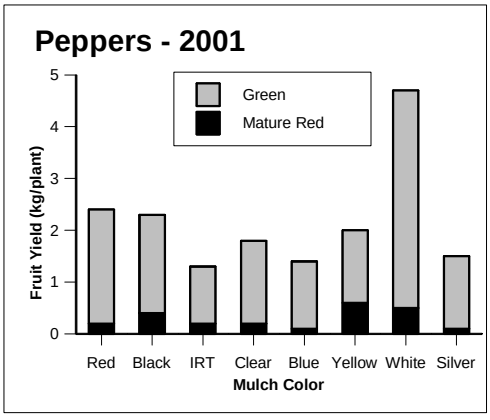
Enhancing Crop Growth with Colored Plastic Mulches

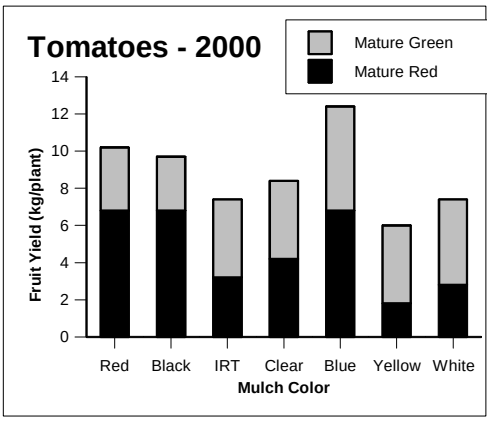
The use of black or IRT soil mulches for weed control and clear mulches for increasing soil temperatures are common practices in vegetable crop production. The development of new colors of mulch may allow growers to alter other aspects of crop growth. Red mulch has been shown to increase early and total yields of tomatoes. Blue mulch improved both the growth and flavor of turnips. Yellow and silver mulches have been shown to repel certain insect pests. **Trial conducted in 2000 and 2001 evaluated the performance of several high value warm season vegetable crops grown on a range of mulch colors.**

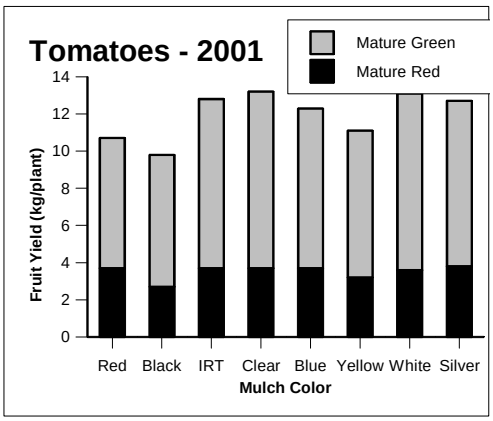
The trial was conducted at the Department of Plant Sciences Horticulture Field research station in Saskatoon in 2000 and 2001. In 2000, clear, black, wavelength selective (IRT), blue, yellow and white mulch were tested. In 2001, silver and red mulches were added to the trial. The mulches were laid about a week prior to establishment of the crop. The peppers, tomatoes and melons were transplanted while the zucchini was direct seeded. Ten plants of each crop were tested. Drip irrigation was used to supply the crops' moisture requirements. The plots were harvested twice weekly once the fruit reached the following stages; peppers - 50% red, tomatoes - breaker stage, melons - full slip, zucchini - 20 cm long. Just prior to the first killing frost, the plots were completely harvested and total fruit yields determined.

Results - Mulch color had little effect on yields of green or mature red fruit in the 2000 pepper crop. In 2001, the white mulch was clearly superior. The basis for this difference is difficult to determine. White mulch reduces soil temperatures which usually slows growth ... but it also reflects light back into the canopy which may increase growth.



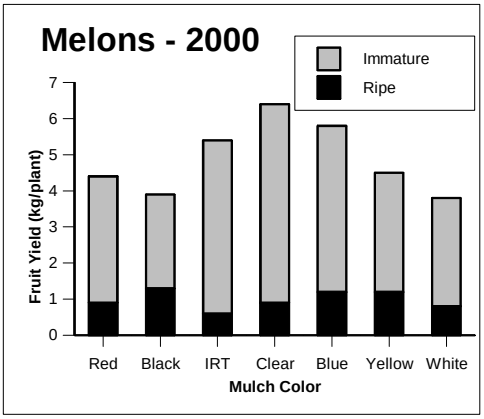


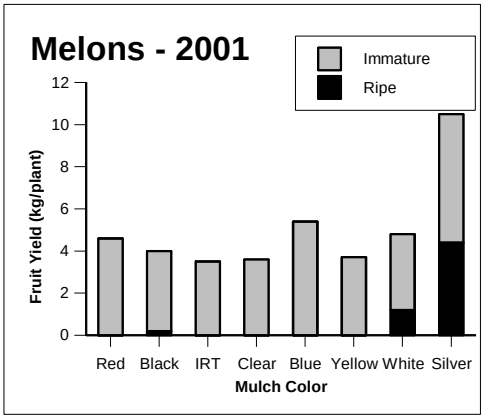


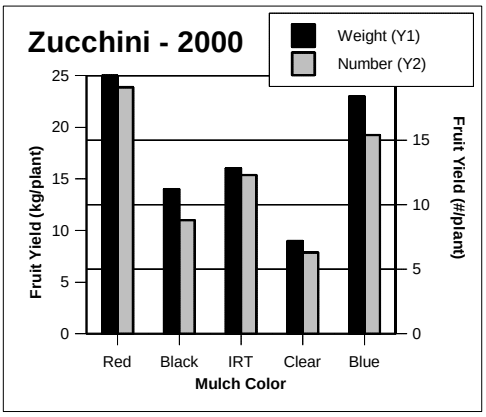


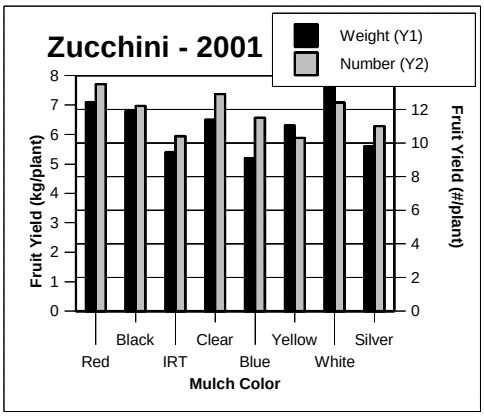
In the 2000 tomato trial, blue mulch produced the highest total yields, followed by the red and black mulch treatments. Yields of mature red fruit were comparable in the red, black and blue mulched treatments. In the 2001 trial there were few consistent differences between the mulch treatments for either ripe or total fruit yields.

In both years only a small fraction of the melon fruit matured within the growing season. In 2000, none of the mulches was obviously superior in its ability to accelerate fruit development. In 2001, silver mulch was clearly superior in terms of accelerating crop maturity. In both years the blue mulches relatively large numbers of fruit.









In 2000, germination of the zucchini was relatively poor in all treatments, with the white and yellow mulches failing to produce any plants. Yields on the red and blue mulches were obviously superior to the other colors. In 2001, all treatments except the clear mulch produced a complete plant stand. White mulch produced the highest yields followed by the red.

Conclusions - **the responses to the mulches varied with the crop and the cropping season.** In 2000, red and blue mulches appeared to enhance growth and yields, while yellow and white mulches performed poorly. By contrast, in 2001, the most reflective mulches (white and silver) produced the best yields. Colored mulches are substantially more expensive than standard types. Growers should consider both the added expense and the lack of consistent responses before selecting to grow with colored mulches.

Light Reflection from Silver Mulch

Silver mulches have been reported to increase plant growth by reflecting light striking the ground back into the undercanopy of the crop. In 2002, peppers (Paladin) and tomatoes (Sunbrite) were grown on standard black plastic mulch. Another strip of mulch was laid adjacent to each side of the crop row. In one treatment, the additional rows of mulch were black plastic while the other treatment was silver. The crops were harvested just prior to frost and the fruit was graded for maturity and freedom from defect.

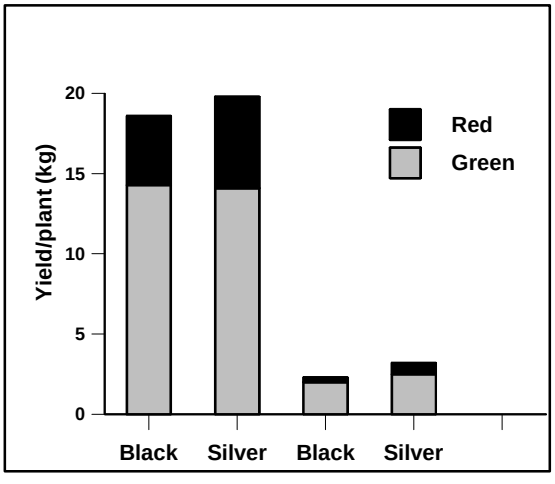
Results.

Positioning strips of silver mulch adjacent to the row increased yields of both crops. In-season measurements of light levels demonstrated that the silver mulches did reflect light back into the canopy. This may explain the increased productivity. Silver mulch is costly and laying multiple layers of mulch in close proximity is impractical. However, this study does demonstrate the merit of using reflective mulches to increase crop growth.

Plant Growth Control by Photoselective Filters

Many warm season vegetable crops benefit from the cover provided by low tunnels. The period that plants can be left in this protected environment is limited - as the plants quickly outgrow the available space. Recently, photoselective filters have been developed that alter the ratio of red to far-red light in incoming sunlight. Plants grown under this filtered light are short and robust - making them ideally suited for a confined growing environment. We conducted trials from 1999-2001 to determine if growing crops under row covers constructed of a photoselective type of polyethylene would produce a more compact growth habit - allowing the covers to be maintained over the crop for extended periods.

In the 2000 trial, melon vines grown inside wavelength selective tunnels (Photomorphogenesis Control Film - YXE10 Mitsui Chemicals Inc.) were longer and weighed less than those produced in the standard perforated poly tunnel. ***The changes in crop development caused by the photoselective cover in the 2000 trial were not desirable from the perspective of controlling elongation while maintaining crop health. As the wavelength selective covering was not perforated, it is possible that the results in 2000 were related to overheating.*** In the 2001 trial, melons (cv. Earligold) and peppers (cv. Legionnaire) were transplanted into black mulch in early June. At transplanting, sections of each crop row were covered with tunnels constructed of either **non-perforated** clear polyethylene or photoselective filter The tunnels were supported above the crop using wire hoops. The ends of the tunnels were closed.. The covers were removed in mid-July at which time three plants from each treatment replicate were measured and weighed. The trial continued until the first frost at which at time the fruit were counted and weighed.



Results

Using wavelength selective plastics as row cover materials provided no appreciable benefits in terms of altering plant growth or enhancing yields. The changes in crop morphology were largely negative and could be attributed to the wavelength selective films producing a hotter and more shaded environment than standard plastics.