SHELF LIFE EXTENSIONS USING CA FILMS

Kailash Sharma/Jeetendra Saraswat
TECHNOFRESH/CHANDRA ASSOCIATES
www.chandraassociates.com

Techno-Fresh
(India) Agri Solutions Pvt. Ltd

THINKING BEYOND

SHELF LIFE EXTENSIONS USING CA FILMS

Program Objective:

1. To maintain quality and freshness of Chives for both ambient and cold chain based protocols
2. To prove that designs with CA Film generate a shelf life greater than that of design without films (control in air)
3. To demonstrate use of CA FILMS will lead to reduction in post harvest losses of Chives

SHELF LIFE EXTENSIONS USING CA FILMS

- CA FILMS is a unique polymer based technology, which is capable of providing different package permeability, in order to create specific oxygen and carbon dioxide levels in a package and maintain this optimum atmosphere

- As the produce consumes oxygen and gives off carbon dioxide, an equilibrium gas concentration is established in the package. This process is a function of the membrane permeability and its carbon dioxide to oxygen selectivity ratio.

- Thus the created atmosphere is able to extend shelf life, maintain high quality and preserve nutrients of fresh produce/flowers by naturally regulating respiration of said items.

- MAPS extends the shelf life of fresh fruits and vegetables by passively modifying the atmosphere of a produce bag to provide the O2/Co2 levels most appropriate for that item.

Techno-Fresh
(India) Agri Solutions Pvt. Ltd

THINKING BEYOND

Effects of temperature on quality of Chives

- As temperature increases, biological reaction rates increase rapidly and so does deterioration. The Q10 coefficient is a factor which measures the increase in respiration rate over a 10°C range and can be used to demonstrate the perishability of herbs as temperature increases. Products with high respiration rates and short shelf-lives tend to have high Q10 values

- Respiration rates of the fresh herbs studied increased by an average of 3.6 times between 0 and 10°C

Techno-Fresh
(India) Agri Solutions Pvt. Ltd

THINKING BEYOND

Chives stored for 12 days at 0, 5 or 10°C

Effects of moisture loss on quality of Chives

- Moisture loss is minimized by low temperatures and relative humidity greater than 95% during storage, packing, transport and marketing

- One of the main reasons fresh herbs are packaged in plastic films is to prevent excessive water loss The high susceptibility of fresh leafy herbs to moisture loss results in loss of marketable weight, visual quality, causes physiological stress and may reduce the product's resistance to attack by pathogens

- Factors that influence the rate of water loss are surface-to-volume ratios, respiration rates, storage temperature and air humidity surrounding the herb

Techno-Fresh
(India) Agri Solutions Pvt. Ltd

THINKING BEYOND

Effects of Modified Atmosphere on quality of Chives

- Elevated CO_2 levels in sealed packages completely overcame the senescence-promoting effect (accelerated leaf yellowing, leaf abscission and downward growth of leaf and petiole, which gives the chives a wilted look) of ethylene on yellowing-susceptible herbs

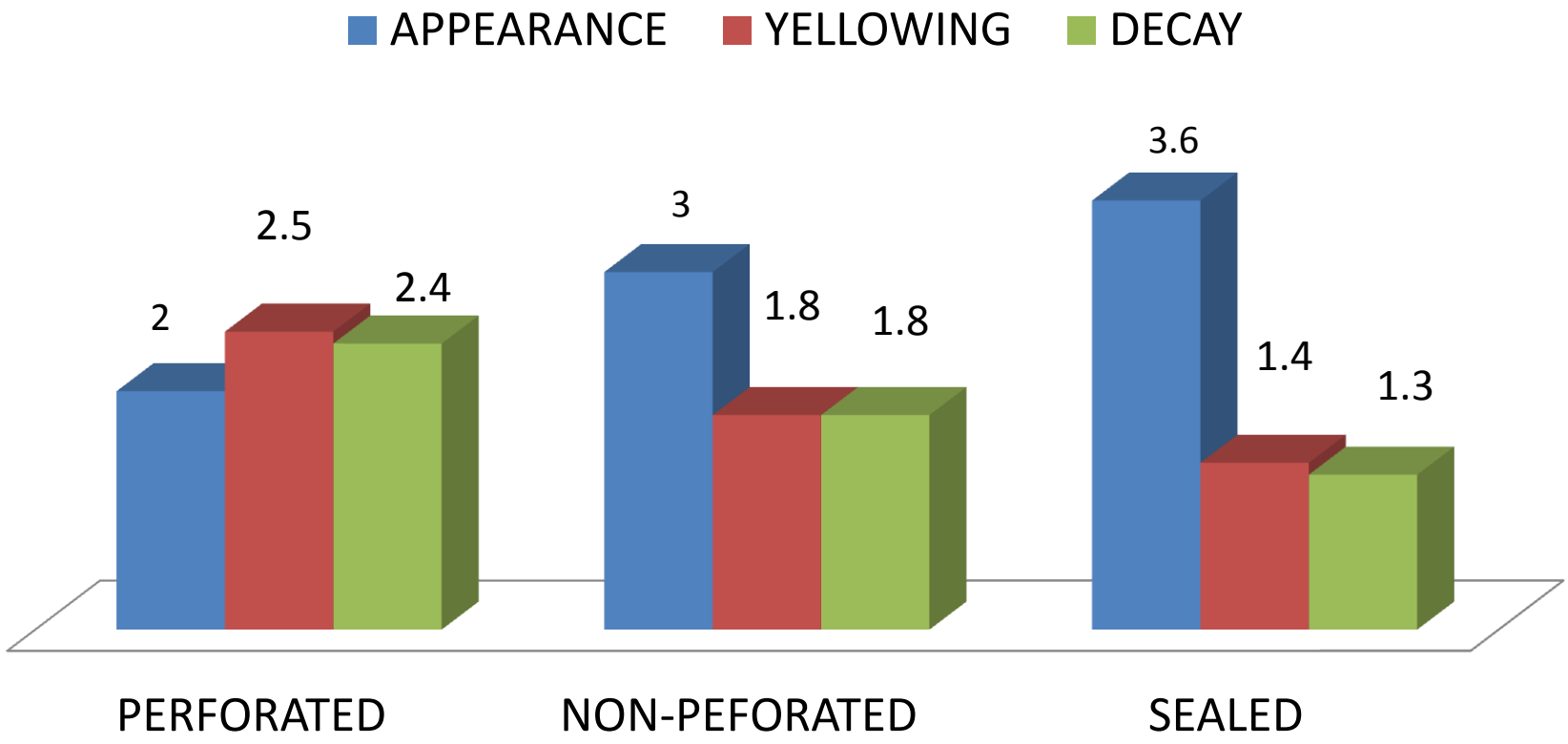
- Increased carbon dioxide levels and lowered oxygen levels retard chlorophyll loss and deterioration in green plant material by reducing respiration, ethylene synthesis and action, pathological breakdown

- Respiration levels were reduced, and chlorophyll, carotene, and Vitamin C levels were maintained longer under MA conditions compared to air storage

Techno-Fresh
(India) Agri Solutions Pvt. Ltd

THINKING BEYOND

Effects of package type on quality of Chives after 5 days at 6°C followed by 2 days at 12°C



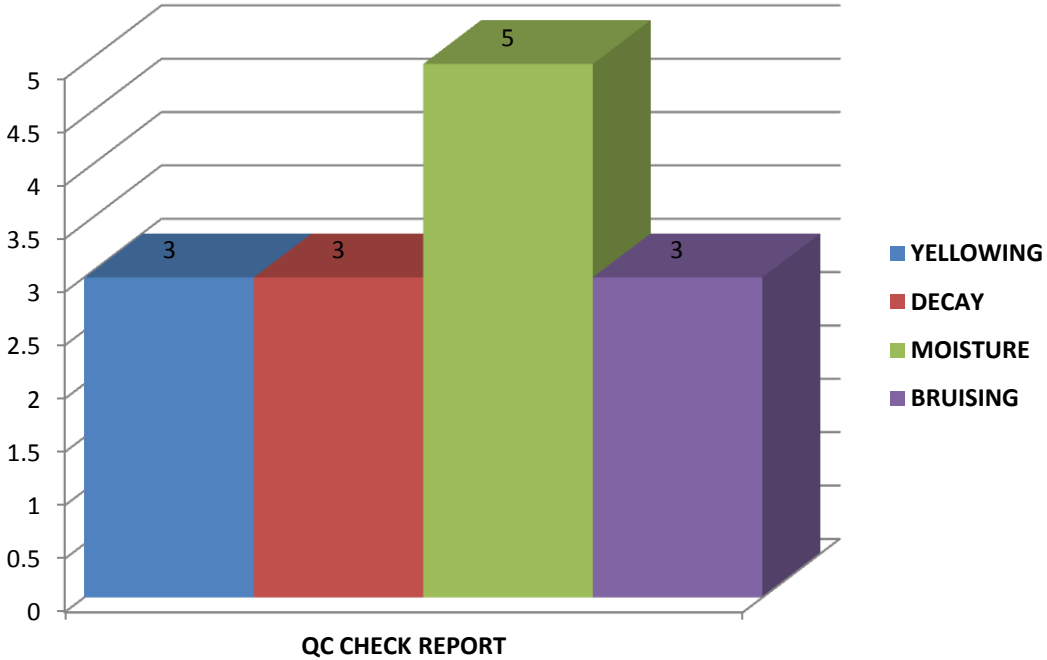
Appearance index: 5 = excellent, 1 = complete deterioration
Yellowing and decay index: 5 = very severe, 1 = none

Chives – Supply Chain

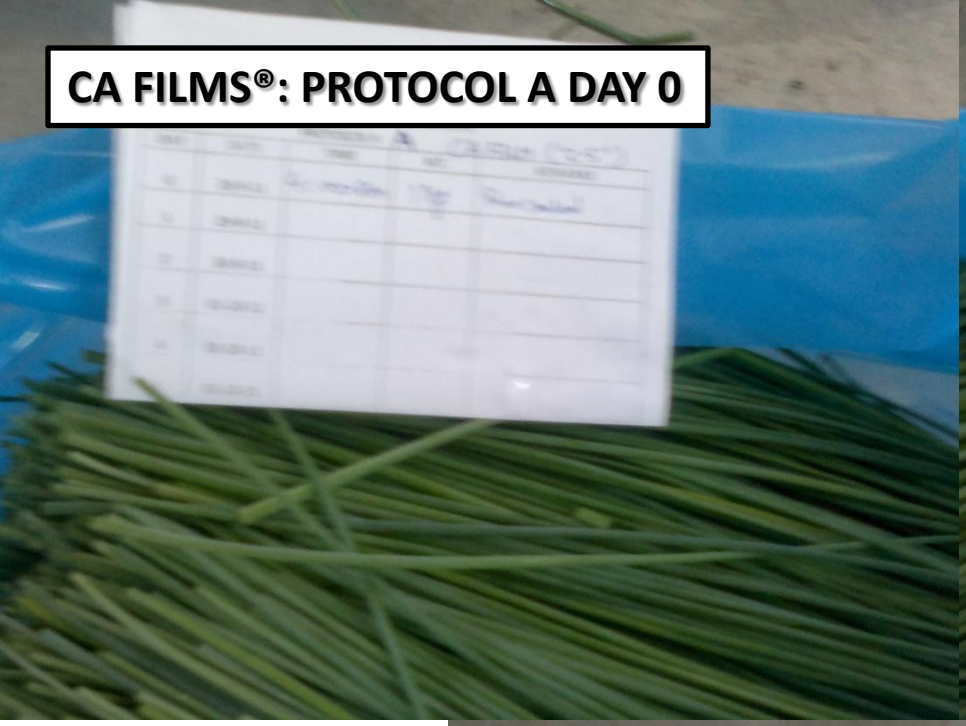
Current problem with quality of Chives (Export)

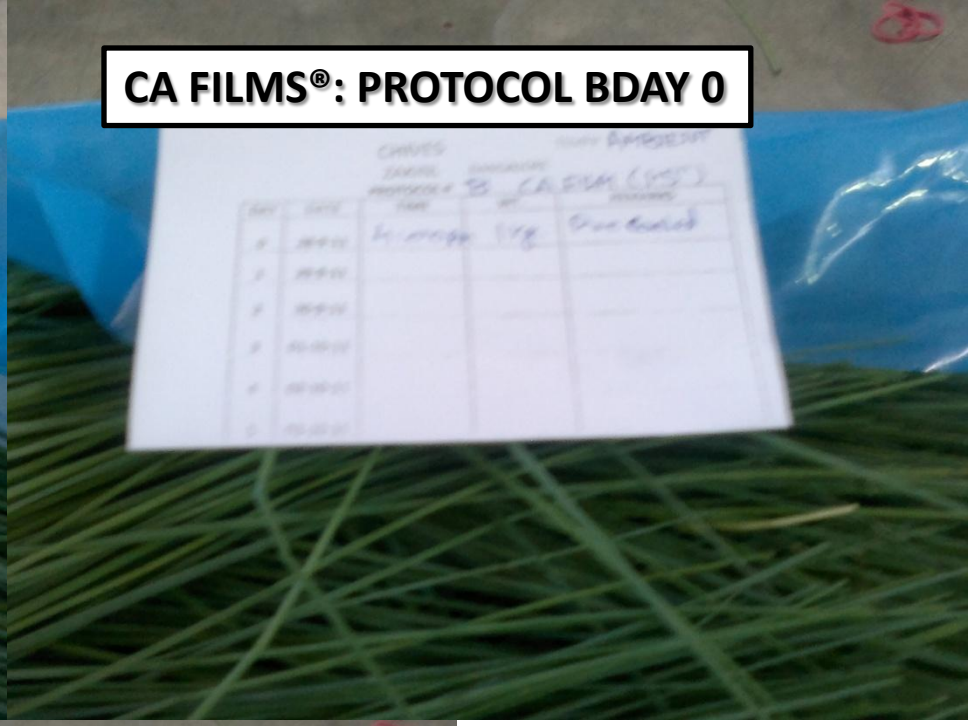
Current problem with quality of Chives (Export)

Moisture, Yellowing and decay index: 5 = very severe, 1 = none



CA FILMS®: TESTING AT AMBIENT TEMPERATURE OF 25-30° C


CA FILMS®: PROTOCOL A DAY 0


CA FILMS®: PROTOCOL BDAY 0

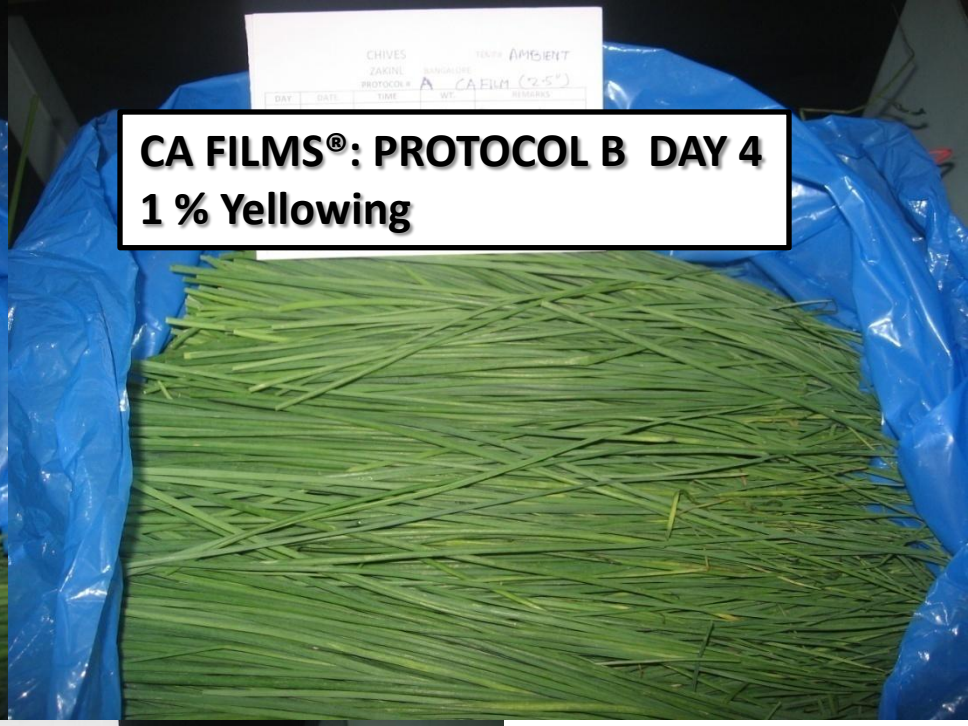
CONTROL PROTOCOL DAY 0

CA FILMS®: PROTOCOL A DAY 2
1 % Yellowing

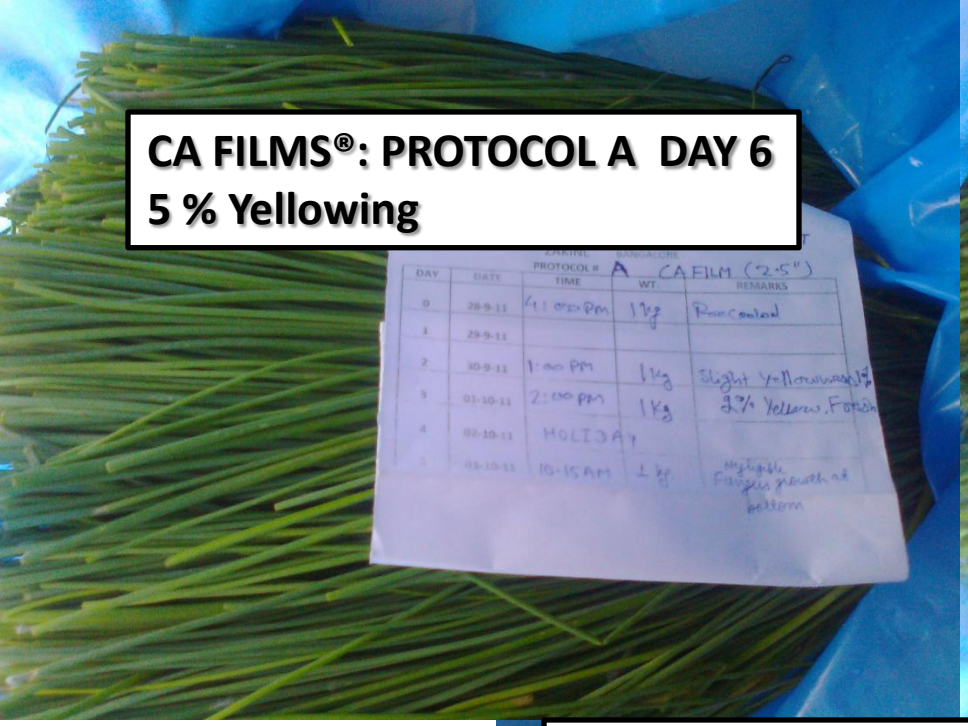
CA FILMS®: PROTOCOL B DAY 2
0.5 % Yellowing

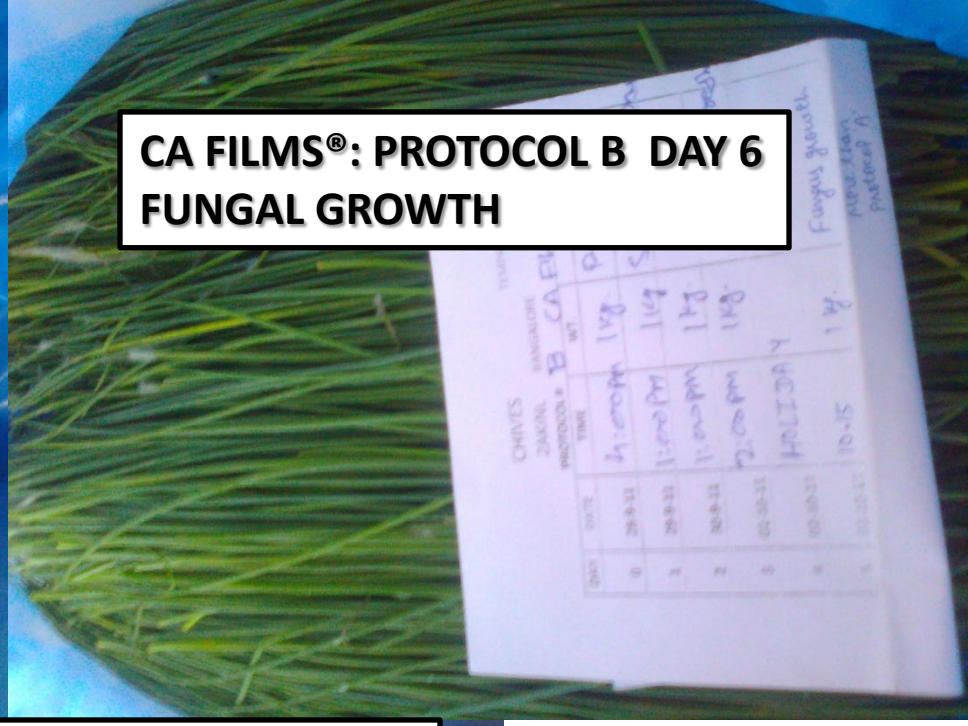
CONTROL PROTOCOL DAY 2
5 % Yellowing, Rotting

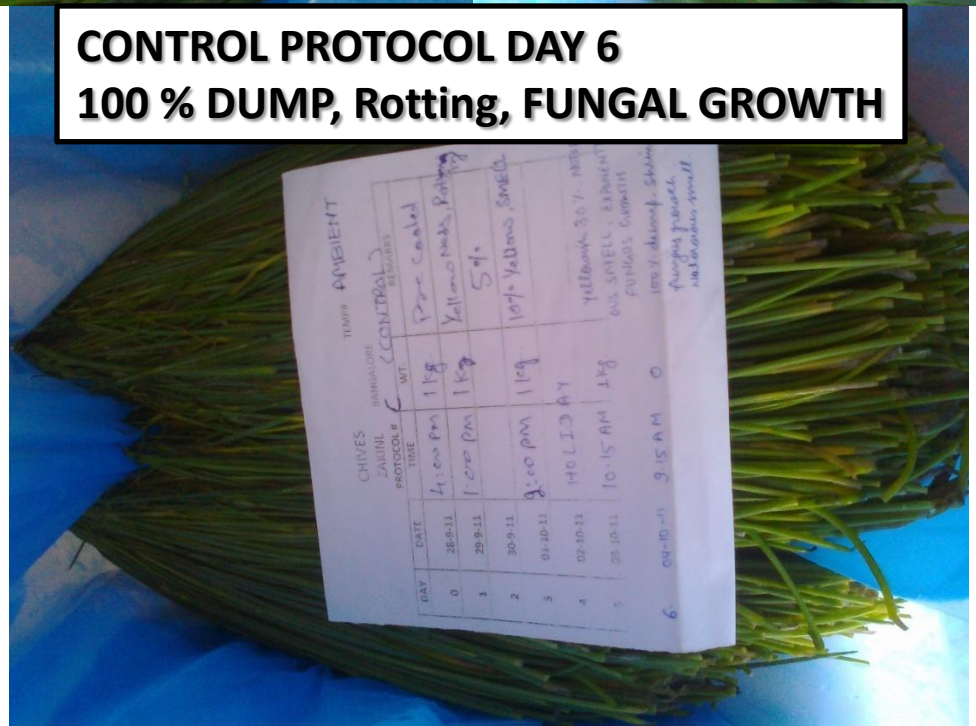
CA FILMS®: PROTOCOL A DAY 4
2 % Yellowing


CA FILMS®: PROTOCOL B DAY 4
1 % Yellowing

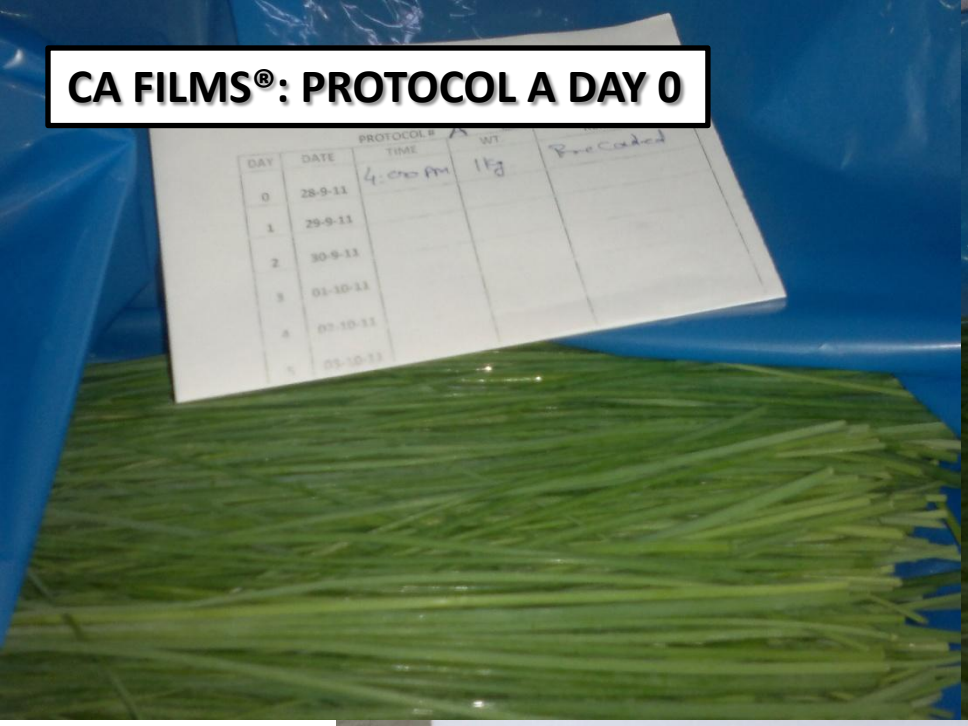
CONTROL PROTOCOL DAY 4
10 % Yellowing, Rotting


CA FILMS®: PROTOCOL A DAY 6
5 % Yellowing
ZAKINL BANGALORE
PROTOCOL # A CA FILM ("2.5")
DAY DATE TIME WT. REMARKS
0 28-9-11 4:00 PM 1kg Pre Cooled
1 29-9-11
2 30-9-11 1:00 PM 1kg Slight Yellowness 1%
3 01-10-11 2:00 PM 1kg 2% Yellows, Fungus
4 02-10-11 HOLIDAY
5 03-10-11 10:15 AM 1 kg. Negligible Fungus growth at bottom

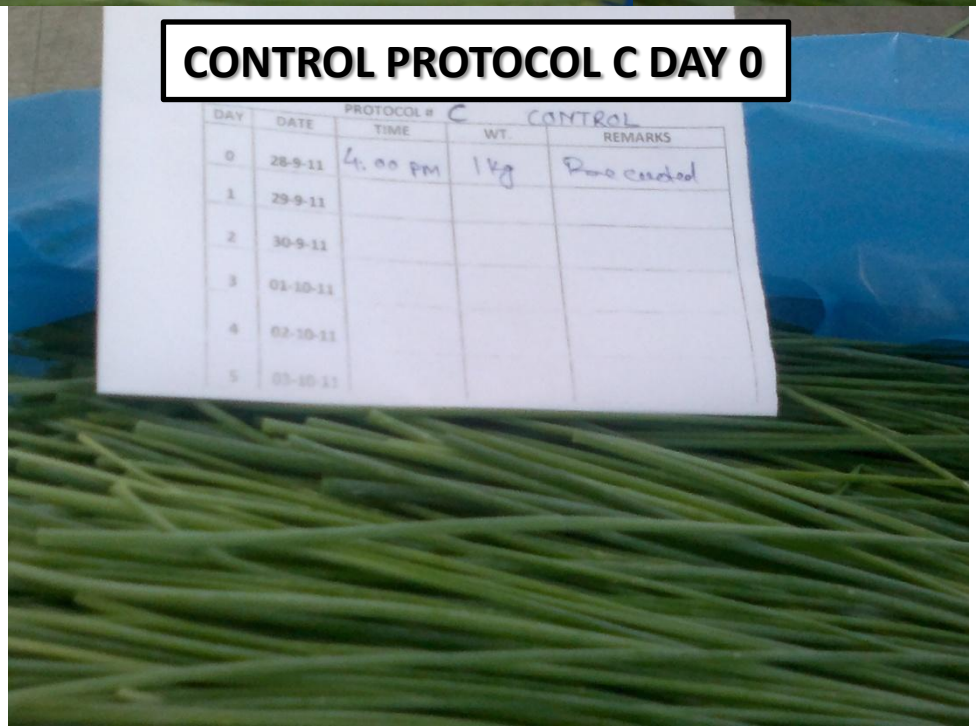

CA FILMS®: PROTOCOL B DAY 6
FUNGAL GROWTH
CHIVES ZAKINL BANGALORE
PROTOCOL # B CA FILM
DAY DATE TIME WT.
0 28-9-11 4:00 PM 1kg
1 29-9-11 1:00 PM 1kg
2 30-9-11 11:00 AM 1kg
3 01-10-11 2:00 PM 1kg
4 02-10-11 HOLIDAY
5 03-10-11 10:15
Fungus growth Potential 1%


CONTROL PROTOCOL DAY 6
100 % DUMP, Rotting, FUNGAL GROWTH
CHIVES ZAKINL BANGALORE
TEMP# AMBIENT
PROTOCOL # C CONTROL
DAY DATE TIME WT. REMARKS
0 28-9-11 4:00 PM 1kg Pre Cooled
1 29-9-11 1:00 PM 1kg Yellowness, Rotting
2 30-9-11 5%
3 01-10-11 2:00 PM 1kg 10% Yellows, SMELL
4 02-10-11 HOLIDAY
5 03-10-11 10:15 AM 1kg 100% Yellowness 30% rotting
6 04-10-11 9:15 AM 0 100% dump, SMELL, EXPONENTIAL FUNGAL GROWTH
Fungus growth, rotting, yellowness, smell

CA FILMS®: TESTING AT COLD TEMPERATURE OF 6° C


CA FILMS®: PROTOCOL A DAY 0
PROTOCOL B A
DAY
DATE
TIME
WT.
0
28-9-11
4:00 PM
1Kg
Pre Cooled
1
29-9-11
2
30-9-11
3
01-10-11
4
02-10-11
5
03-10-11

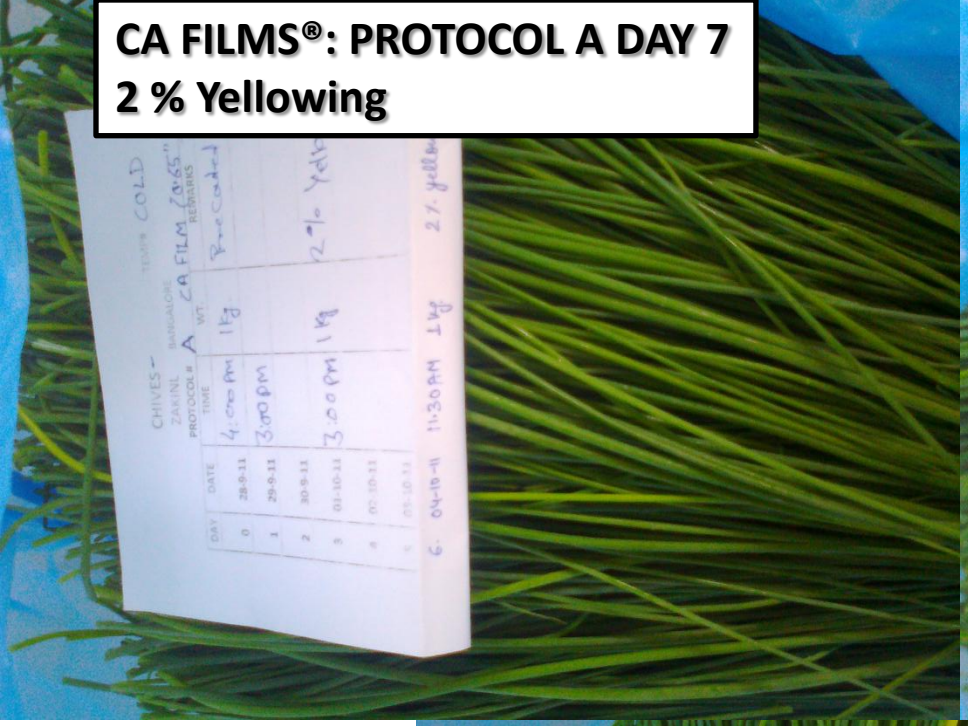
CA FILMS®: PROTOCOL B DAY 0
0
28-9-11
4.00PM
1Kg
1
29-9-11
2
30-9-11
3
01-10-11
4
02-10-11
5
03-10-11

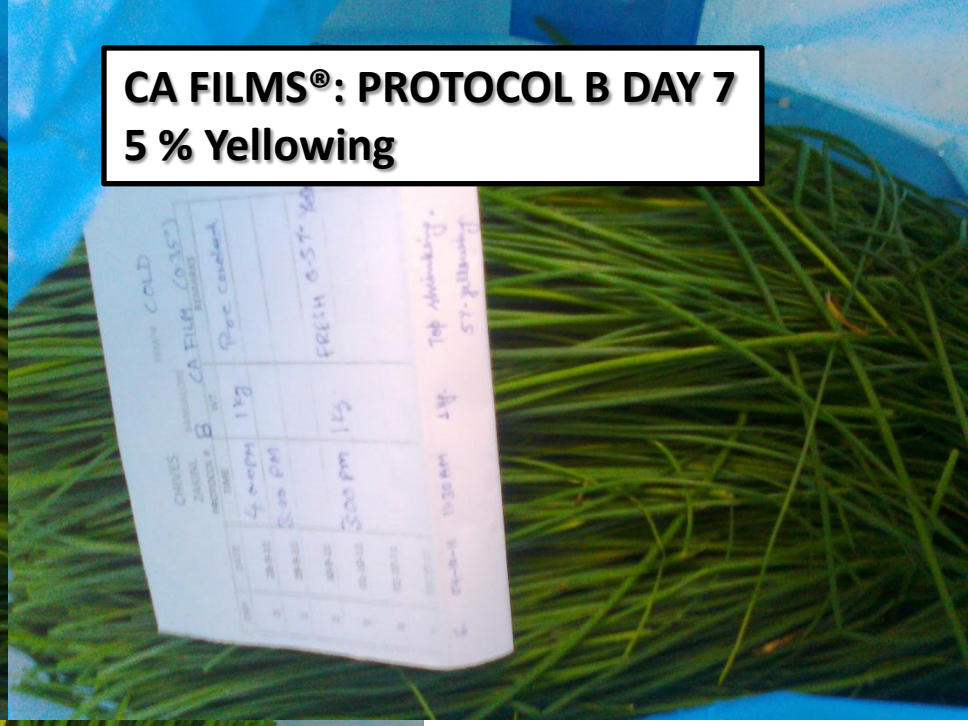

CONTROL PROTOCOL C DAY 0
PROTOCOL # C CONTROL
DAY
DATE
TIME
WT.
REMARKS
0
28-9-11
4.00 PM
1Kg
Pre cooled
1
29-9-11
2
30-9-11
3
01-10-11
4
02-10-11
5
03-10-11

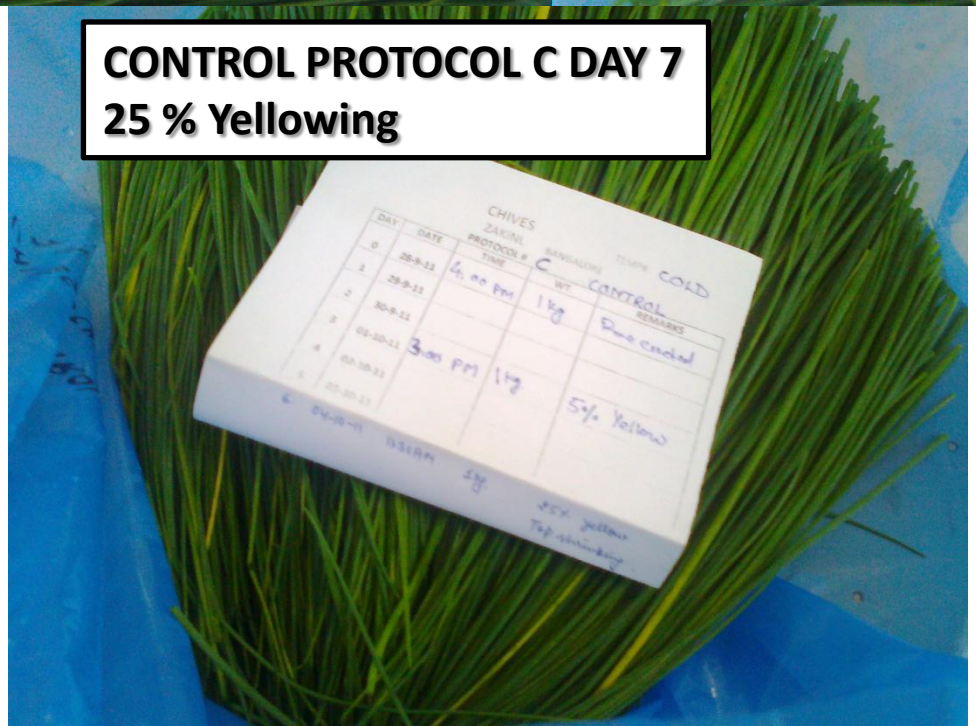
CA FILMS®: PROTOCOL A DAY 4
1 % Yellowing

CA FILMS®: PROTOCOL B DAY 4
0.5 % Yellowing

CONTROL PROTOCOL C DAY 4
5 % Yellowing
CHIVES
ZAKINI
BANGALORE
TEMPR COLD
PROTOCOL # C
CONTROL
DAY
DATE
TIME
WT
REMARKS
0
28-9-11
4.00 PM
1kg
Pure condition
1
29-9-11
2
30-9-11
3
01-10-11
3.00 PM
1kg
5% Yellow
4
02-10-11


CA FILMS®: PROTOCOL A DAY 7
2 % Yellowing


CA FILMS®: PROTOCOL B DAY 7
5 % Yellowing


CONTROL PROTOCOL C DAY 7
25 % Yellowing

CA FILMS®: PROTOCOL A DAY 14
20 % Yellowing

CA FILMS®: PROTOCOL B DAY 14
40 % Yellowing

CONTROL PROTOCOL C DAY 14
80 % Yellowing

CONCLUSIONS

- CA FILMS® based packaging for both ambient and cold chain protocols:
  - ensured the reduction in moisture losses
  - the increased carbon dioxide levels and lowered oxygen levels, intrinsic property of CA FILMS®, retarded chlorophyll loss and deterioration by reducing respiration, ethylene synthesis and action, pathological breakdown
  - elevated CO2 levels in sealed packages completely overcame the senescence-promoting effect
- CA FILMS® based packaging extended the shelf life of Chives at ambient temperatures to 7+ days and at cold chain to 14+ days

Techno-Fresh
(India) Agri Solutions Pvt. Ltd.