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A L G E R S

QUANTITY STANDARDS OF PLASTIC
MATERIEL USED IN AGRICULTURE
AND AGRONOMIC PARAMETERS
APPRECIATIONS

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I- INTRODUCTION:

The utilization of plastic materials in agriculture started first in the so-called "rich" countries. However, today the tendency is for their use to become preponderant in the developing countries with temperate, arid or semi-arid climate.

Agriculture represents an important outlet for plastic products, their applications in the field of cultivating techniques constitute the main domain where the utilization of polyéthylènes is primarily affirmed.

Plastic materials are also found in other activities such as packing in food industries where demand for these products is in constant increase for practical reasons.

In this talk, we will put the emphasis on the products most used in Algeria. Those are plastics which are called for in the production process of various-vegetals.

We will also mention the plastics used in food packing namely in dairy industry.

For all these products, we will review features relating to standards and quality control from an agronomical angle taking into account the climatic conditions prevailing in tempered, semi-arid or arid regions.

II- PLASTIC MATERIALS USED IN AGRICULTURE AND FOOD INDUSTRY.

2.1- Agriculture.

2.1.1- In the field of cultivating technics .

We will list the plastic materials the use of which is widespread in this field where one finds in chronological order:

- Plastic films for greenhouse "roofing, greenhouse shelters and small tunnel ("Nantais or sahelian").
- Plastic films for hay covering ?
- Plastic films for
- Plastic films for paillage
- Plastic mesh
 - Fencing mesh
 - Wind breaking mesh
 - Shadow mesh etc...
 - Plastic sheaths for irrigation
 - Plastic tarpaulins.

2.2.- Food industry:

In this field plastic materials are used as:

- Dairy packing
- Packing nets
- Plastic bags
- Plastic boxes etc...

III- THE IMPORTANCE OF PLASTICS UTILIZATION IN ALGERIA.

In quantity terms, the major use of plastic materials in the field of cultivating technics is to be noted (30 000 per year are consumed in Algeria); the essential part being made of low density polyethylènes.

As for the use of plastic materials in food industry, except for packing boxes for fruits and vegetables, the plastics used for dairy products are the most widely consumed in Algeria.

IV- QUALITY STANDARDS.

Standard correspond to a of criteria one must expect from a product aswell as test methods for control.

4.1- Plastic films:

The quality of a plastic film is identified with :

- Its density measured on raw material
- Its fluidity index on heated raw material and on finished product.
- Regularity of thicknesses
- Its resistance to traction on sheets and raw material.
- Is resistance to cracking
- Is aging time
- Is stretching
- Is impermeability to long infra red rays
- Is transmission.

In the absence of defined standards in Algeria, we recall here in the standards on criteria applied in France, while remaining strict spécifique to semi-arid or arid climates.

These criteria relate primarily to :

- The density of raw material
- The fluidity index when heated
- The natural or accelerated aging time.
- The resistance to cracking
- The traction, stretching to breaking.

4.2- Standards applied to polyéthylène films.

4.2.1.- Neutral films.

Caractéristiques	Spécifications measured on sheet		Spécifications measured on raw material.
Density	-		Supérieur or equal to 0.917g/cm ²
Fluidity index when heated	inferior to 2		Inferior or equal to 2.
Thickness regularity	the tickness indicated on label must be respected to + 15 % on all points of sheet.		-
Traction leading to breaking	-		Superior or equal to 130 kgF/cm ² .
Traction leading to the edge of running	Superior to 97 kgF/cm ² in the two senses of the sheet.		Superior or equal to 98 kgF/cm ² .
Traction stretching to breaking	Superior to 350% in the two senses of the sheet.		Superior or equal to 375%.
Resistence to cracking.	-		Supérieur or equal to 250 hours.
Artificial accelerated aging for a film of 200 microns nominal thickness.	Resistence superior to 8 days.		-
Stretching or shrinkage at 100 °C.	lengthwise shrinkage inferior to 2 %	crosse vise stretching inferior to 3,5 %.	-

4.2.2.- Stabilized films.

Characteristics	Spécifications measured on sheet	Spécifications measured on raw material
Density	-	Comprised between 0,917 and 0,922 gr/cm ² .
Fluidity index when heated	-	Inferior or equal to 1
Thickness regularity	Thickness shown on label must be respected to $\pm 15\%$ an all points of sheet.	-
Traction leading to breaking	-	Superior or equal to 150 kg f/cm ² .
Traction leading to the edge of running	-	Superior or equal to 150 kg f/cm ² .
traction stretching to breaking	Superior to 450 % in the two senses of the sheet	Superior or equal to 450%.
Resistence to craking	-	Superior or equal to 500 hours.
Artificial accelerated aging for a film of 200 microns thickness	Superior to 14 days.	-
Stretching or shrinkage at 100°C.	Lengthwise crosswise.	Shrinkage inferior. to 2% stretching inferior to 3,5%.

4.2.3. Ethylene vinyl acetate film

Characteristics	Specifications
Density	0,95 gr:cm ²
VA rate	14 %
Density index when measured	0,5 %
Thickness regularity	thickness indicated on label on all points must be respected to $\pm 15\%$ of sheet.
Stretching to breaking	superior or equal to 500 %
Resistance to cracking	superior to 500 hours
Artificial accelerated aging for a 200 microns film.	superior to 14 days.

4.2.4- Black films

Characteristics	spécifications measured on sheet	Spécifications measured on rax material.
Density	-	Superior or equal to 0,917 gr/cm ² .
Thickness	Thickness indicated on label must be respected to $\pm 15\%$ on all points of sheet.	-
Stretching to b. g	400% lengthwise 570% crosswise	-
Traction leading to the edge of running.	superior to 97 kgf/cm ²	Superior or equal to 98 kgf/cm ² .
Resistence to rapid perforation.	The weight correspond- ding to 50% breaking must be superior to 210 gr.	-
Stretching or shrinkage at 100°C.	The film must not shorten by more than 5% lengthwise and it must not stretch by more than 3,5% crosswise	-
Content in carbon black.	Superior to 2,3% $\pm (0,20\%)$.	-

4.2.5 Photodamageable films

Photodamageable films are made from photodamageable polyéthylène insuring.

- a high mechanical resistance
- a good "greenhouse effect".

Technical characteristics

- Transparent or black film
- thickness in accordance with user's convenience with respect of thickness to $\pm 15\%$.
- Resistance to cross breaking 330 kg f/cm².
- Resistance to length wise breaking 440 kg f/cm².
- Resistance to stretching
 - Crosswise 670 %
 - Lengthwise 440 %.

Photodamage:

Due to solar radiation and temperature, the film becomes breakable, cracks and falls in small specks.

Remark: These standards are those applied by the study center for plastic materials (CEMP - FRANCE).

4.2.6- Dairy packing

Dairy industry is the biggest utilizer of plastic packing where one finds:

- Polyethylene film -bag
- Polystyrene bands "yoghourt"
- " " "fresh cheese"
- Plastic boxes melted cheese
- cases boxes, plastic vats.

The choice plastic materials used in dairy packing obeys several principal:

- Resistance of the packing to breaking
- Garanty that the packing is water proof and impermeable.
- Garanty of health ruies
- The raw material must be insoluble, inactive towards food products.
- The plastic packing must offer all use conveniences(coating, varnish, welding, thermoshaping).
- The dimensions (thickness, width, weight) must be in accordance with preestablished standards.

4.3 Comments:

4.3.1.- Films for greenhouse roofing

In Algeria we find three types of climate:

- Tempered on the coast
- Semi-arid on the high plains
- Arid in the oases.

The standards defined for greenhouse roofing films are in general in accordance with the climatic conditions of the Algerian coastline.

This standard conformity a film is measured by:

- Its mechanical resistance
- its resistance to cracking
- its thermal balance sheet.

We must point out that the climatic conditions on the Algerian seaboard are more or less similar to those of the North coast of the Mediterranean; the behavior of plastic films complying with the above defined standards is satisfactory.

However, when we deal with arid climatic conditions, the plastic material must admit of more performing physical-chemical properties.

so as to resist to bad climatic conditions to which it is subjected namely.

- a serious damage due to ultra-violet rays
- a strong alteration induced by sand winds
- high thermal amplitudes.

For those reasons the plastic materials must carry more performing specifications such as:

- Fluidity index when heated inferior to 1,5
- Traction to breaking point (superior to) 170 kg f/cm²
- Traction stretching to breaking superior to 450%.

- Resistance to cracking superior to 500 hours
- Artificial accelerated aging superior to 14 days.
- High thermal balance sheet.

It is very important to comply with specifications so that the plastic film lasts two or three agricultural seasons that is to say two winters and one summer or three winters and two summers assuming the greenhouse roofing is done starting from October.

4.3.2.- Black films.

Generally used in Algeria as:

- Mulching film
- Hay stack covering
- Forage covering.

The defined properties are sufficient for the different film recommended.

The opacity criterion must be respected to avoid any problem resulting from tight.

4.3.3.- Mesh and plastic sheaths:

These materials are expected to last a long time, therefore they must show a very good stability against ultra violet rays, in order to avoid a rapid damage.

Consequently one must be careful to choose:

- a 0,3 grade resin
- a good pigment (carbon black)
- an addition of anti U.V. and anti oxydizing element.

V- QUALITY CONTROL:

Throughout the world control checking is exercised by the engineers of the quality control service.

The samples to be controlled are taken from raw material or finished products at the plant or at any stage.

Of distribution.

The samples to be checked have an area of 15m².

In Algeria, there exist several quality controls.

5.1.- Control before hand

It is generally done at the plant by the manufacture and in a laboratory by specialized departements. This control is confor tunately done only at the request of the user.

5.2.- Prosterior control:

It is done in an experimental station and aims et checking certain technical specifications of the product namely:

- Naturel agins
- Mecanical resistance
- Reistence to cracking.
- Impermeability to long infra redj.

5.2.1- Procedure:

Films are prit in real production conditions according to an experimental protocole. The films to be tested are compred with a "neutral" material, that is to say, not heving been treated by anti ultra violet stabilizers or infra red additives. The testing of the plastic materials is carried by making observations on the products, the greenhouse climat and on the vegetals.

5.2.1.1.- Observations made on film:

they bear on

- Vrackings induced by ultra violet rays
- Mechanical tearings created by winds
- Transmission to radiation.
- decoloring.

All notations are done regulary.

5.2.1.2- Bioclimatological observations.

Climatic measures are conducted at any time of the day with recording thermohydrographs.

These measured bear on:

- The temperature
- The hygrometry.

5.2.1.3.- Observations on vegetals:

Observations are effected on cultivated vegetals in which it is noted:

- the growth of the plants
- the total yields etc...

All these notations provide a precise idea on the quality of the used plastic material. The quality is appraised by the resistance of the plastic film to the damage inflicted by ultra violet rays. The attacks generate crackings and bursting of the film. The cracking phenomenon is the more important in semi arid or arid climate due to very strong solar radiation in such an environnement.

a bad mechanical resistance of film results in good part from the poor quality of the raw material (fluidity index when heated superior to 2 on raw material and finished product). Further the high thermal amplitudes and frequent frost risks incite to the use of thermal films (impermeable to infrareds).

This is why this criterion is considered an important quality factor to be taken into account in determining quality standards regarding films for greenhouse roofing. This criterion has a direct impact on "green-house effect" In other words thermal films (infra red) provide a better thermal balance sheet compared with neutral films (2°c more in general).

VI - RECOMMANDATIONS

Plastic materials made by national petrochemical industry show drawbacks identified to :

- a limited duration : 4 to 6 months for greenhouse films.
- a very strong permeability to infra reds
- a thickness irregularity .
- absence of marking on finished product.
- an insufficient coloring for opaque films.

It is clear that plastic products suffer from quality problems due generally to a lack of quality control structures as well as adequate standards adapted to Algeria climatic condition quality improvement must be preceded by the establishment of a systematic control of all plastic products used in agriculture and food industry.

In principle this control does not exist yet in Algeria, or at least it is not carried by autonomous bodies.

In order to grasp these quality aspects it is necessary first:

- to define clearly quality standards
- insure that they are strictly applied by establishing a structure with powers to control.

The establishment of a control body will not only insure that legislation relating to plastic products is respected but will encourage the development of all activities in the field of plastic products.

Hence, the institutions in charge of quality control will not only play a police role, but thanks to official labs, experimental stations, they will have a beneficial impact on raising the quality level of plastic products and on the mentality of the users. In the marketing domain, quality control will facilitate relations among manufacturers, distributors and farmers since henceforth everyone must obey only preestablished quality standards.