SCAA Best Practice | Guidelines for Using By-Pass in the Drip Coffee Brewing Process

Prepared by the Technical Standards Committee

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Introduction

The ability to brew coffee with by-pass has been around for decades; however, help in understanding the effects on the brewing process has not always been readily available. It is not easy to find published guidelines for use of by-pass. The only mention of it that is generally available to industry professionals is one paragraph in Chapter 6 of *The Coffee Brewing Handbook* by Ted Lingle, First Edition.

There are a variety of purposes and reasons to include using by-pass brewing in the repertoire of coffee brewing methods:

1. To prevent over-extraction
2. To allow adjustment of brew time to match grind size
3. In order to gain brew filter margin and so prevent overflow
4. Any number of other reasons

While by-pass can be used for all of the above, it is especially useful when optimizing each volume for flavor/ taste control on multi batch-size brewing equipment.

This guide shows how to calculate new values for the existing Coffee Brewing Control Charts and the percentage of by-pass for the new values.

Rationale

By-pass percentage relates directly to brew volume and time.

For example:

Consider a 4000 ml (135.25 ounces) brew volume with a 4-minute water-cycle time. Using a 25% by-pass, only 3000 ml (101.5 ounces) of water would pass through the ground coffee and the water-cycle time would be reduced to 3 minutes.

This method creates a beverage that balances concentrate and dilution. However, there are no set rules relating to the percentage of water volume by-passed. In *The Coffee Brewing Handbook*, Ted Lingle recommends that up to 40% of the water by-pass the coffee grounds.

Another example:

Using 100 grams of coffee per 2 liters of water (100 grams/2 liters), the resulting beverage strength measures 1.20%. Figure 1 shows the extraction percentage is 21.5%.

When the brew formula is doubled to 200 grams/ 4 liters, the bed depth of ground coffee has increased in the funnel and the water cycle time must be increased. This may easily result in stronger brew strength and an extraction greater than 22.0%. This is a common issue when coffee is delivered in pre-portioned packs.

Example 1 (Without by-pass)

100 grams/ 2000 ml @ 1.20% (12,000TDS) strength / 21.5% yield (extraction)

(See Figure 1 on page 5)

To use this same chart for larger volumes, simply calculate the Brewing Ratio values.

Example: 50 grams/ 1 liter equals 100 grams/ 2 liters.

How is the percentage of by-pass volume calculated? The simple way is to use basic algebra.

Example 2

To use the printed Coffee Brewing Control Chart (CBCC) requires a calculation to determine the revised value for each formula line to plot the brew results.

Example: 50 grams/ 1 liter equals 200 grams/ 4 liters.

(See Figure 2 on page 6)

200 grams ÷ 220 grams = 0.909 (round to 0.91)

200 is approximately 91% of 220 or a 9% difference.

The percentage difference in coffee weight is the percentage of by-pass volume. (0.09 x 4000 ml = 360 ml) This is the volume by-passed around the ground coffee.

The revised coffee / water ratio is now 200 grams / 3640 ml.

(220 ÷ 4000) x 3640 = 200

The ratio of 220 / 4000 is equal to 200 / 3640.

The concentrate portion of the brew (TDS) would be recorded on the 55-gram line of the 1 liter Coffee Brewing Control Chart.

Example 3

Again, using the printed Coffee Brewing Control Chart (CBCC) requires a calculation to determine the revised value for each formula line to plot the results.

(See Figure 3 on page 7)

300 grams ÷ 360 grams = 0.833 (round to 0.83)

300 is approximately 83% of 360 or a 17% difference.

The percentage of difference in coffee weight is the percentage of by-pass volume.

0.17 x 6000 ml = 1020 ml

This is the volume by-passed around the coffee.

The revised formula is now 300 grams / 4980 ml. (360 ÷6000) x 4980 = 300.

The ratio of 360 / 6000 is equal to 300 / 4980.

The concentrate portion of the brew strength would be plotted on the 60-gram line of the 1 liter Coffee Brewing Control Chart.

Calculations for Example(s) 2 & 3

Use your brew strength readings and brew formula values. Method (1) of calculating the concentrate strength is to measure the brew strength of the finished brew (concentrate and dilution/ by-pass).

A finished brew strength of (1.2 % ÷ 0.91) = 1.3180 %.

Rounded to 1.32% strength and plotted on the 55-gram line. The extraction percentage would be 21.3% yield.

Method (2) would be to brew 3640 ml/ 200 grams and measure the brew strength without the dilution/ by-pass volume, then add (blend in) 360 ml, measure brew strength again.

200 grams/ 3640 ml @ 1.32 % soluble (strength) / 21.3 % yield (extraction).

Method (3) would be to calculate the finished beverage strength.

0.91 x 1.32 = 1.20

As the finished beverage strength after 360 ml of dilution / by-pass volume is blended in to complete the brew.

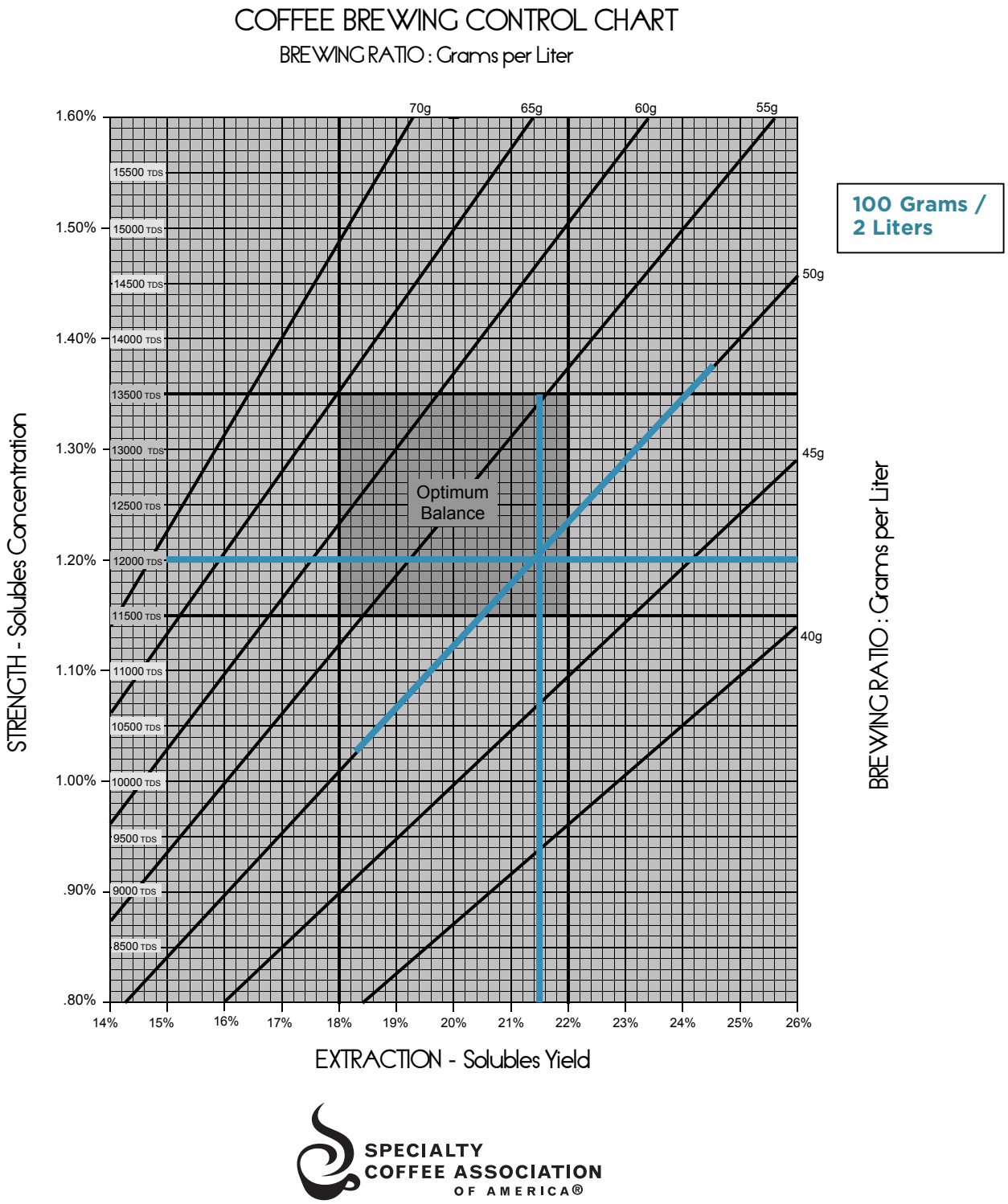
COFFEE BREWING CONTROL CHART
BREWING RATIO : Grams per Liter
70g
65g
60g
55g
50g
45g
40g
1.60%
1.50%
1.40%
1.30%
1.20%
1.10%
1.00%
.90%
.80%
15500 TDS
15000 TDS
14500 TDS
14000 TDS
13500 TDS
13000 TDS
12500 TDS
12000 TDS
11500 TDS
11000 TDS
10500 TDS
10000 TDS
9500 TDS
9000 TDS
8500 TDS
Optimum Balance
14%
15%
16%
17%
18%
19%
20%
21%
22%
23%
24%
25%
26%
STRENGTH - Solubles Concentration
EXTRACTION - Solubles Yield
BREWING RATIO : Grams per Liter
100 Grams / 2 Liters
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Figure 1

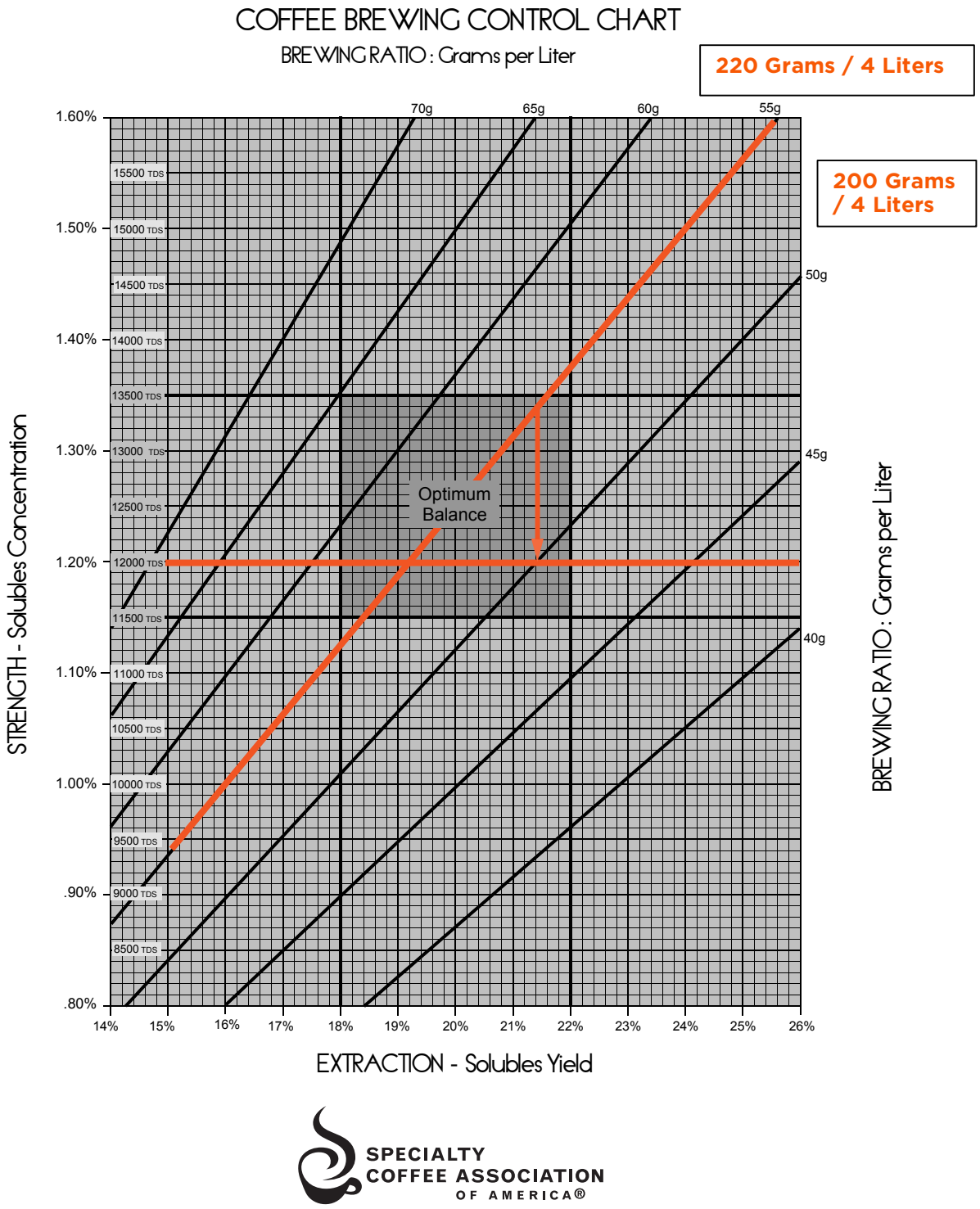
COFFEE BREWING CONTROL CHART
BREWING RATIO : Grams per Liter
220 Grams / 4 Liters
200 Grams / 4 Liters
70g
65g
60g
55g
50g
45g
40g
1.60%
1.50%
1.40%
1.30%
1.20%
1.10%
1.00%
.90%
.80%
15500 TDS
15000 TDS
14500 TDS
14000 TDS
13500 TDS
13000 TDS
12500 TDS
12000 TDS
11500 TDS
11000 TDS
10500 TDS
10000 TDS
9500 TDS
9000 TDS
8500 TDS
Optimum Balance
14%
15%
16%
17%
18%
19%
20%
21%
22%
23%
24%
25%
26%
STRENGTH - Solubles Concentration
EXTRACTION - Solubles Yield
BREWING RATIO : Grams per Liter
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Figure 2

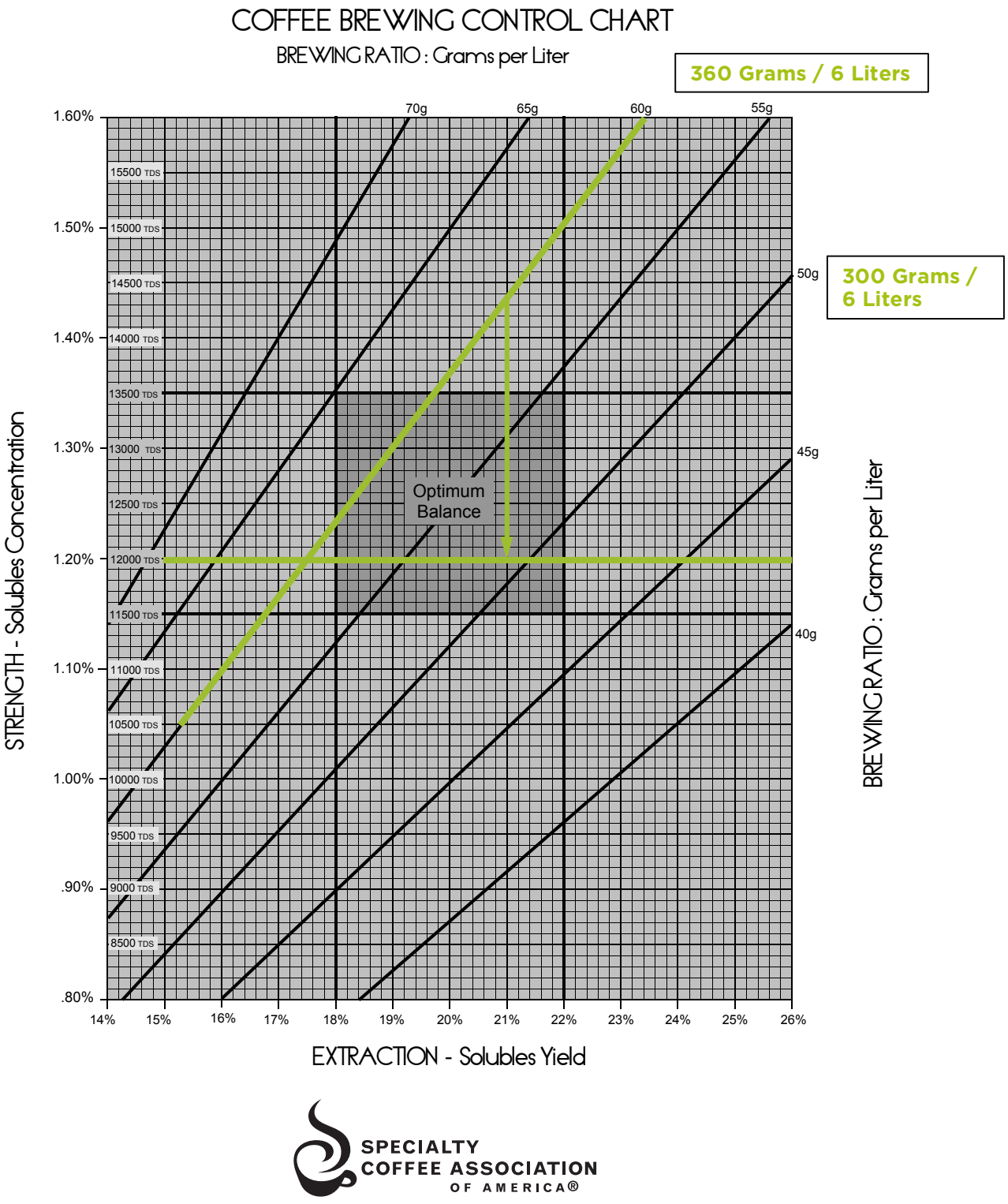
COFFEE BREWING CONTROL CHART
BREWING RATIO : Grams per Liter
360 Grams / 6 Liters
300 Grams / 6 Liters
70g
65g
60g
55g
50g
45g
40g
1.60%
1.50%
1.40%
1.30%
1.20%
1.10%
1.00%
.90%
.80%
15500 TDS
15000 TDS
14500 TDS
14000 TDS
13500 TDS
13000 TDS
12500 TDS
12000 TDS
11500 TDS
11000 TDS
10500 TDS
10000 TDS
9500 TDS
9000 TDS
8500 TDS
Optimum Balance
14%
15%
16%
17%
18%
19%
20%
21%
22%
23%
24%
25%
26%
STRENGTH - Solubles Concentration
EXTRACTION - Solubles Yield
BREWING RATIO : Grams per Liter
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Figure 3