乾燥方式對毛豆蛋白功能之影響

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新鮮毛豆仁以含 0.15%碳酸鈉之去離子水稀釋 3 倍打碎後，在 80℃進行 5~8 分鐘熱萃可得較佳之萃取品質。比較其經滾筒乾燥及冷凍乾燥所得毛豆粉之色澤、溶解度、膨潤力及起泡能力與泡沫穩定性，皆以冷凍乾燥者為佳。當利用滾筒乾燥進行毛豆抽出物乾燥時，添加食用膠雖可改善粉末色澤，但卻也會使其溶解度及膨潤力下降。至於利用冷凍乾燥毛豆粉末製作蛋糕，則以添加 1/4 量毛豆冷凍乾燥粉末取代低筋麵粉者之品質最佳。

試驗中有關碳酸鈉濃度及萃取時間對萃取液品質之影響，見於圖 1、2 碳酸鈉添加可有效防止毛豆綠色色澤蛻變，同時亦可促進毛豆可溶性固形物之抽出。至於毛豆乾燥粉末品質之比較分析由圖 3~ 6 得知乾燥色澤變化以冷凍乾燥者最佳，而滾筒乾燥溫度高至 120℃後，雖可縮短乾燥時間，但卻會使毛豆粉色澤產生劣變。圖 7、圖 8 為不同乾燥毛豆粉末溶解度及膨潤力之比較。各種乾燥粉末其溶解度膨潤力皆隨溫度升高而有增加現象，其中又以冷凍乾燥者為高，而 120℃滾筒乾燥最低。就滾筒乾燥處理者而言，其在 70℃~90℃復水時，發現隨乾燥溫度之增加，而毛豆粉之膨潤力與溶解度皆有上升趨勢，惟當溫度達 120℃則明顯下降，可能與過度受熱產生褐變反應有關。至於經冷凍乾燥及 115℃滾筒乾燥之毛豆粉，其起泡能力經測定結果分別為 15.2 ml/g 及 13.5 ml/g。而其泡末穩定性則如圖 9 所示：冷凍乾燥毛豆粉具有較高之起泡性及泡沫穩定性，可能與毛豆蛋白乾燥時受熱程度有關。由本試驗結果顯示：冷凍乾燥毛豆粉較之滾筒乾燥更適於用於冰淇淋及蛋糕等產品使用。表 2 及圖 12 為利用毛豆粉末取代低筋麵粉對蛋糕品質之影響，試驗結果顯示：毛豆與蛋黃混合烘培，具有加乘蛋糕芳香味之功能。利用冷凍乾燥毛豆粉末製作戚楓蛋糕其用量為毛豆：低筋麵粉＝1：3 時無論香味、色澤及質地皆屬最佳。

表 1.毛豆抽出物乾燥粉末色澤之比較

Table 1. Comparison of the color among vegetable soybean- extracting dried powders.

Treatment	Color			-a/b
	L	a	b	
EFD	69.6	-10.1	29.8	0.339
EDD115	67.8	-5.8	25.6	0.227
EDD115G	68.1	-6.8	26.3	0.259

Vegetable soybean-extracting dried powder with freeze- drying(.EFD), with drum drying at 115℃(EDD115), and with drum drying at 115℃ after added gum (EDD115G).

The color were expressed as Hunter L. a. b. value: L:100(white); 0(black),a:(red);-(green),

b: +(yellow);-(blue)

表 2.不同比例冷凍乾燥毛豆粉末添加對蛋糕品質之影響

Table 2. Effect of various ratio of freezing dehydrated vegetable soybean powder added on the qualities of cake.

Ratio of VGSB	Hardness (g)	Color			-a/b	Texture
		L	a	b		
0	120	71.75	8.98	29.8	-	Fine
1/5	80	65.87	-0.5	25.93	0.02	Fine
1/4	80	67.73	-2.4	27.3	0.09	Fine
1/3	100	66.70	-2.2	28.85	0.08	Coarse
1/3-egg	100	62.70	-2.47	21.95	0.11	Coarse

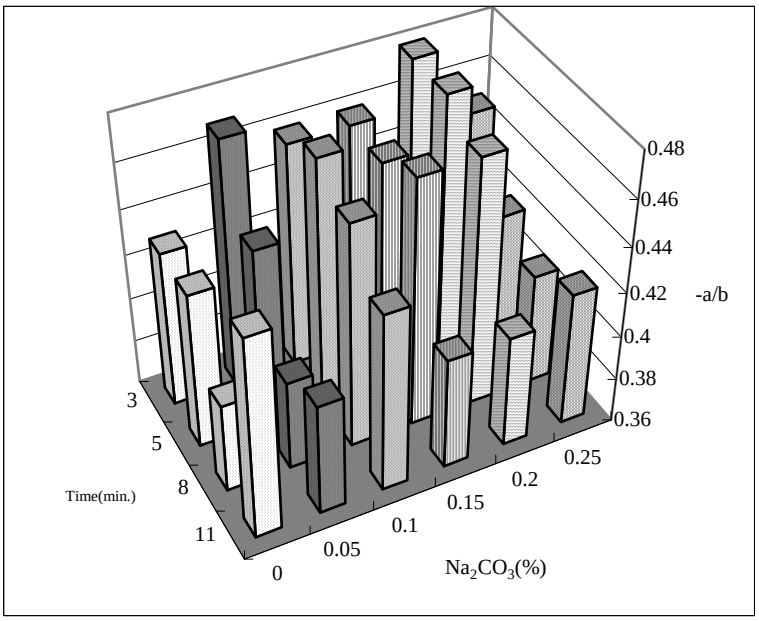

圖 1.不同碳酸鈉濃度及熱萃時間對毛豆三倍稀釋液萃取色澤之影響

Fig. 1. Effect of the extracting time and the concentration of Na_2CO_3 on the color of 3 times dilution extracting solution of vegetable soybean.

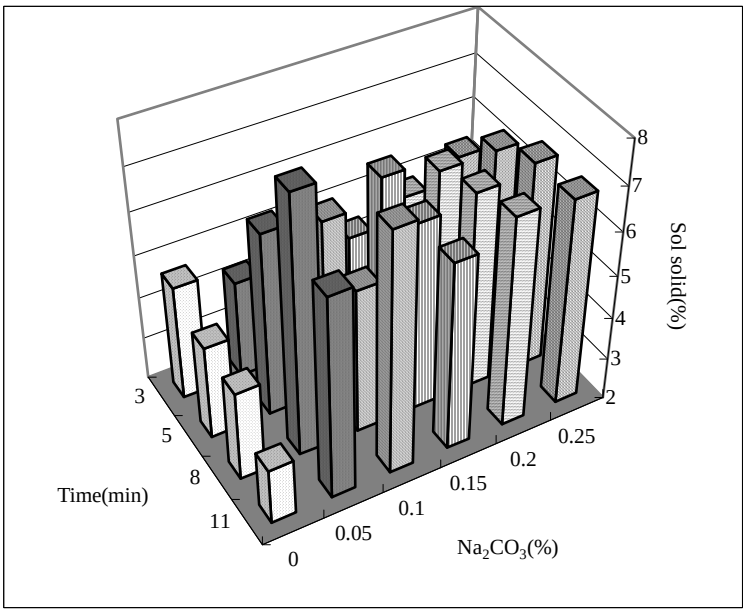

圖 2.不同碳酸鈉濃度及熱萃時間對毛豆三倍稀釋可溶性固形物萃取影響

Fig. 2. Effect of the extracting time and the concentration of Na_2CO_3 on the soluble solid contain of 3 times dilution extracting solution of vegetable soybean.

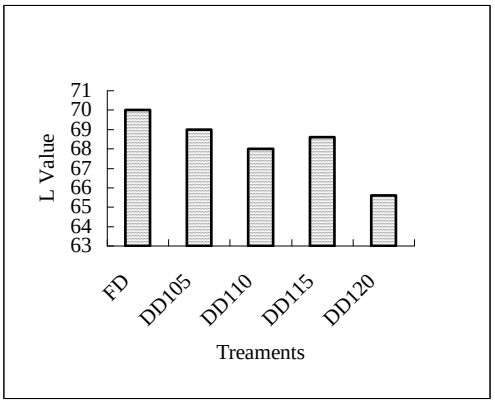

圖 3. 毛豆乾燥粉末 L 值之比較

Fig.3 Comparison of the L value of vegetable soybean flours.

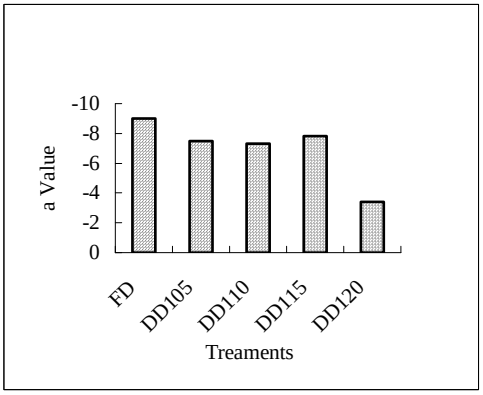

圖 4. 毛豆乾燥粉末 a 值之比較

Fig.4 Comparison of the a value of vegetable soybean flours.

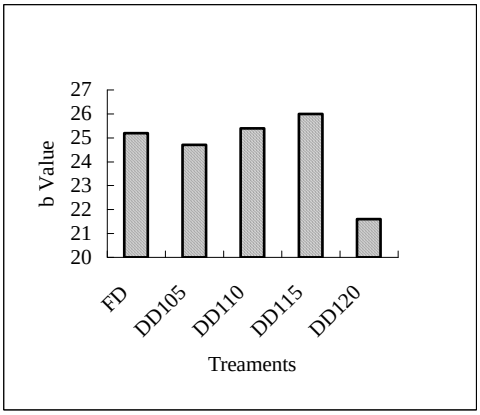

圖 5. 毛豆乾燥粉末 b 值之比較

Fig.5 Comparison of the b value of vegetable soybean flours.

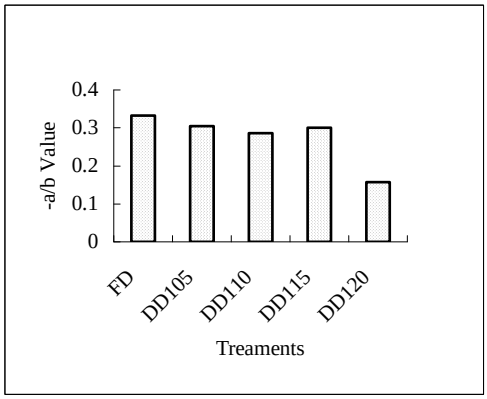

圖 6. 毛豆乾燥粉末-a/b 值之比較

Fig.6 Comparison of the −a/b value of vegetable soybean flours.

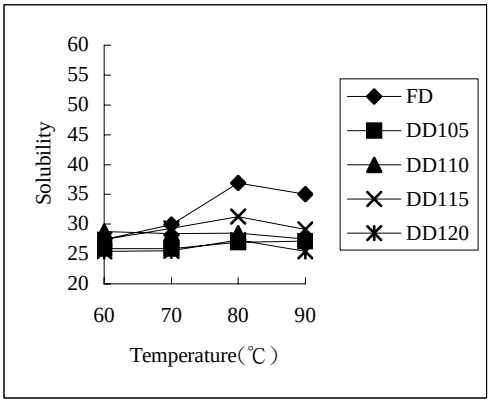

圖 7. 不同溫度復水毛豆粉溶解度之比較

Fig.7 Comparison of the solubility of vegetable soybean flours at various temperature.

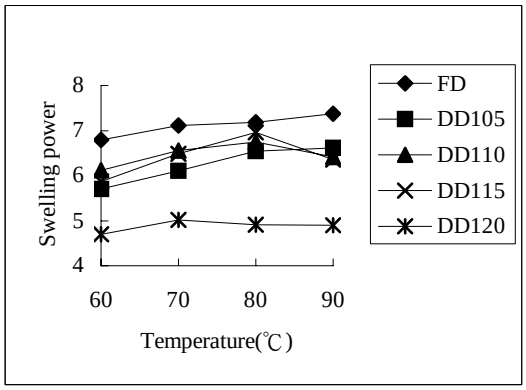

圖 8. 不同溫度復水毛豆粉膨潤力之比較

Fig.8 Comparison of the swelling power of vegetable soybean flours at various temperature.

The treatments of vegetable soybean flours in Fig.3- 8 were indicated at follow: FD: with freeze- drying, DD105: with drum drying at 105℃, DD110: with drum drying at 110℃, DD115: with drum drying at 115℃, and DD120: with drum drying at 120℃.

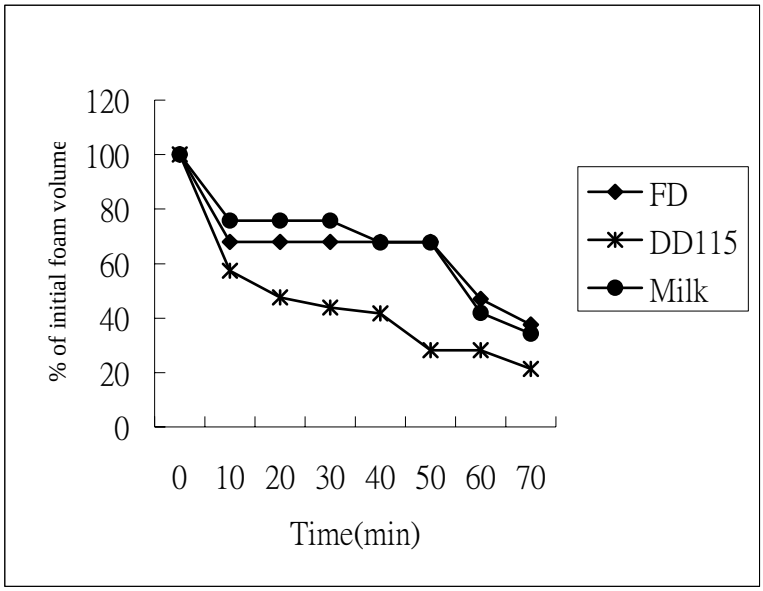

圖 9.毛豆乾燥粉末泡末穩定性之比較

Fig.9. Foam stability of vegetable soybean flours.

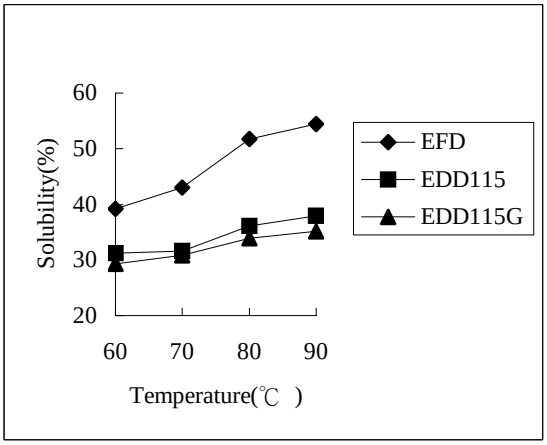

圖 10. 不同溫度復水毛豆抽出物乾燥粉溶解度之比較

Fig. 10 Comparison of the solubility of vegetable soybean-extracting dried powder at various temperature.

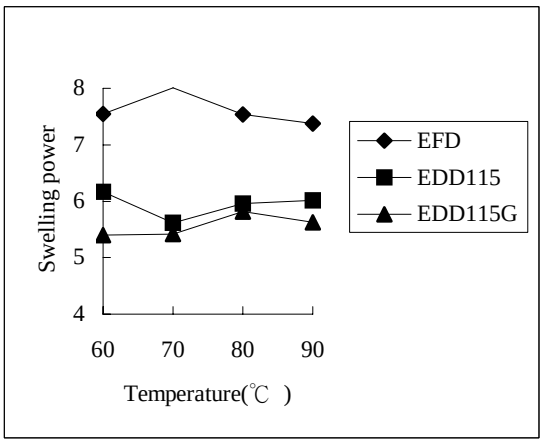

圖 11. 不同溫度復水毛豆抽出物乾燥粉膨潤力之比較

Fig.11 Comparison of the swelling power of vegetable soybean-extracting dried powder at various temperature.

Vegetable soybean-extracting dried powder with freeze- drying(.EFD), with drum drying at 115℃ (EDD115), and with drum drying at 115℃ after added gum (EDD115G).

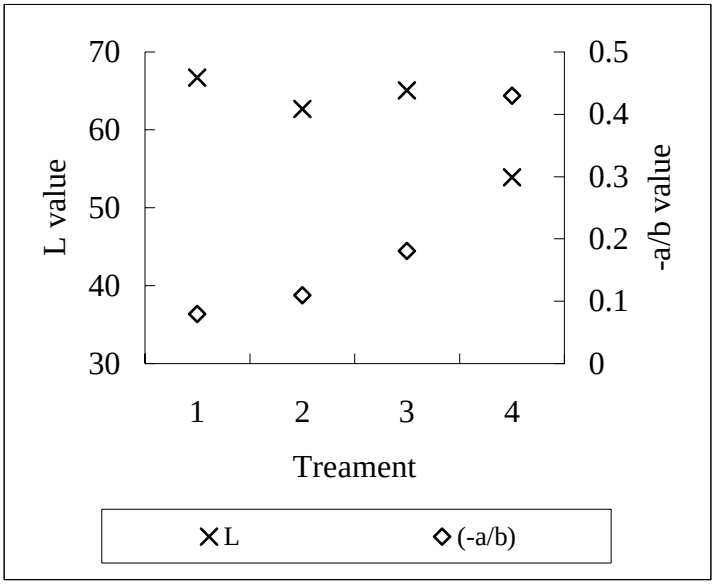

圖 12.新鮮毛豆及冷凍乾燥粉末製作蛋糕之色澤比較

Fig. 12. Comparison of the color of vegetable soybean cake made from the fresh materials and the freezing dehydration powder.

Treatment 1, 2, 3 and 4 indictor the cake made from freezing dehydration powder with egg yolk, freezing dehydration powder with SP, fresh vegetable soybean with yolk and fresh vegetable soybean with SP to emulsified, respectively.