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OPTIMIZATION OF SPRAY DRYED RASPBERRY JUICE, WITH A VALUE ADDITION OF PROBIOTICS

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ABSTRACT

To increase the availability of probiotic in non dairy products (raspberry juice), combinations of probiotic are used. Maltodextrin plays an important role in spray drying.

User defined response surface method is used for optimization, with two independent variable spray drying inlet temperature (◦c) and maltodextrin ratio, to find out the dependent output percentage recovery. Changing the inlet temperature (◦c) and maltodextrin ratio has a greater impact on the recovery percentage. The consumption of probiotic is increased nowadays and acts as a substitute for people who has lactose intolerance.

KEYWORDS: Probiotic, Maltodextrin, Spray Drying & Optimization

INTRODUCTION

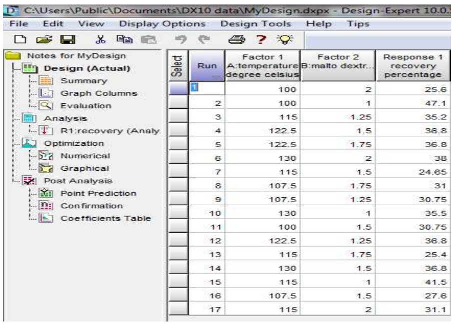
Probiotic bacteria have become increasingly popular, during the last decades as a result of the continuously expanding scientific evidence pointing to their benefits effects on human health. As a result, they have been applied as various products with the food industry having been very active, in studying and promoting them (Maria kechagia, Dimitrios, 2013). Nondairy food applications include soy based products, nutrition bar, cereals and a wide variety of juices as appropriate means of probiotic delivery to the consumer (J. A. Ewe, W. A. Wan nadiah, 2010). Most probiotic foods in the current market are refrigerated dairy based products (Burgain, Gaiani, Linder& Scher, 2011), while preparations of non-dairy foods will attract a broader range of consumers, with different preferences. The food matrix encapsulation must act as a buffer during storage, as well as in the stomach transit until the probiotic is delivered, to the intestinal tract along with offering a protection during thermal processing (Ranadheera, Baines, & Adams, 2010). The proanthocyanins present in berries, such as cranberries, can modulate the immune system in conjunction with probiotics (Reid, 2002). Anthocyanin rich raspberries also have a high amount of dietary fibers (6.5 g/100 g), with good absorption characteristics which could potentially serve as a carrier and microencapsulating agent, as well as a probiotic (Chiou & Langrish, 2007). This supports our premise of studying the combination of probiotics organisms with raspberry juice for spray drying.

MATERIALS AND METHODS

Two varieties of probiotic (Lactobacillus rhamnosus NRRL B-4495 and Lactobacillus Acidophilus NRRL B-44) were obtained from the USDA’s Agricultural Research Services Culture Collection. Dried pellets were reconstituted in 50 ml MRS broth (deMan, Rogosa and sharpe medium). The extracted raspberry pulp had a solid content of 13to 14Brix measured, by a portable refract meter (Fischer Scientific, USA). The seeds and skin were sieved out using a fine metal sieve filter. The Brix unit was adjusted to 11 (total solid concentration0.1 g/L) as otherwise the pure extract was too viscous to be spray dried. Spray drying of raspberry juice with maltodextrin as an additive (wall material) at different ratios. The culture is added in raspberry juice and mixed with maltodextrin, to increase the recovery and spray drying technique is performed (Kartheek Anekella, ValérieOrsat, 2012)

User Defined RSM Technique

The process optimization is done like the reference journal, but for central composite design in response surface method is changed to user defined model, to produce different outcome and to find out the most efficient method. The spray drying inlet temperature (◦c) and maltodextrin ratio is taken as independent variables, to find out the dependent variable recovery percentage. A user defined function with 17 responses is created at last as shown in below fig 1.



Run	Factor 1 A:temperature degree celsius	Factor 2 B:malto dextr...	Response 1 recovery percentage
1	100	2	25.6
2	100	1	47.1
3	115	1.25	35.2
4	122.5	1.5	36.8
5	122.5	1.75	36.8
6	130	2	38
7	115	1.5	24.65
8	107.5	1.75	31
9	107.5	1.25	30.75
10	130	1	35.5
11	100	1.5	30.75
12	122.5	1.25	36.8
13	115	1.75	25.4
14	130	1.5	36.8
15	115	1	41.5
16	107.5	1.5	27.6
17	115	2	31.1

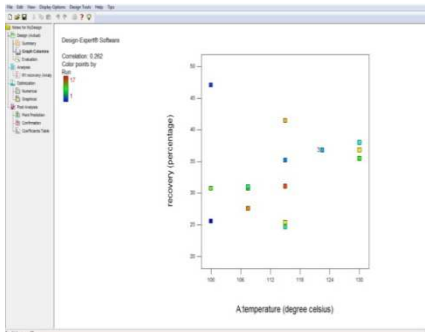
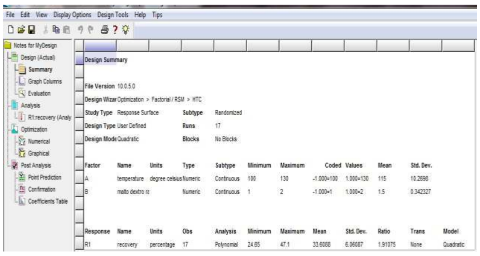


Figure 1 **Figure 2**

RESULTS

Recovery %

Spray drying process optimization using RSM. The spray dried powder recovery varied between 25% and 55%, depending on the maltodextrin ratio and inlet temperature. The graph showing co-relation between temperature and recovery percentage is shown in Fig 2. The model used is quadratic. Temperature is varied from 100◦c to 130 ◦c and maltodextrin is varied from 1 to 2. And, the response is varied from 24.65 minimum to 47.1 maximum recoveries as shown in the fig 3. From the **anova** table for response surface quadratic model, the model f value of 5.90 implies the model is significant. There is only a0.69% chance that an f valve the larger could occur, due to noise as shown in the fig 4.



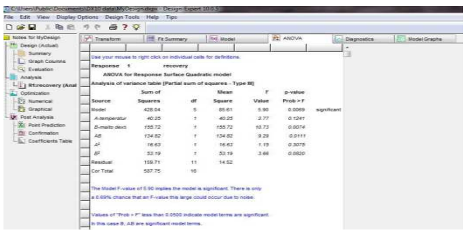


Figure 3 **Figure 4**

Equation in term of coded factor for percentage recovery is given as

$$RECOVERY = +30.60 + 2.32*A - 4.56*B + 5.63*AB + 2.45*A^2 + 4.38*B^2$$

Over all optimized conditions were determined at 121.68◦C inlet temperature, maltodextrin ratio of 1.86:1, where the maximum output dependent variables were obtained with 47.1% recovery, in user defined response surface method.

DISCUSSIONS

The walls of the spray drying chamber was layered completely with the raspberry solids by the end of spray drying, due to the stickiness of the solutions which lead to major losses in product recovery. An interesting observation from the obtained data is that, the temperature had a minimal role in powder recovery. From the response plot (Fig.4), maltodextrin ratio had significant effects on % recovery of produced powder, from raspberry juice. As the maltodextrin ratio increased to 2, the powder recovery dropped to 33%. Reducing the maltodextrin ratio can increase the powder recovery, but it will affect the cell survival of the probiotic, due to reduced encapsulation efficiency. The below graph shows(fig 5.) the relation between maltodextrinratio, temperature (degree Celsius) and recovery percentage. Overall, maltodextrin is confirmed to serve as a good encapsulating matrix, as well as a moderate probiotic for high survival of probiotics (Cortés-Arminio, López-Malo, & Palou, 2010).

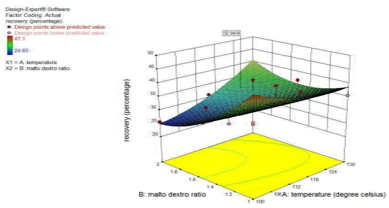


Figure 5

CONCLUSIONS

Maltodextrin ratio and inlet temperature have a major effect on recovery and the optimization equation followed a linear two factor model. Both the models (user defined and central composite design) are compared, and it is observed that, best result is given by central composite design with a recovery of 48.76%, than user defined model 47.1% recovery. Non-dairy probiotic foods are becoming popular, as they do not pose problems of lactose intolerance, while they offer an alternative.

REFERENCES

1. Burgain. J, Gaiani. C, Linder. M,&Scher. J.(2011). Encapsulation of probiotic living Cells: from laboratory scale to industrial applications. Journal of Food Engineering, 104, 467e483.
2. Maria Kechagia, DimitriosBasoulis, Health benefits of probiotic a review, article ID 81651, volume 2013.
3. J. A. Ewe, W. A. Wannadiah, viability and growth characteristic of lactobacillus in soymilk supplemented with B-vitamin, international journal of food science and nutrition, vol 61, pp 87- 107,2010
4. Carvalho. A. S, Silva. J&Gibbs. P.(2003). Effects of Addition of Sucrose and Salt and of Starvation upon thermo tolerance and survival during storage of freeze-dried Lactobacillus delbrueckii ssp. bulgaricus. Journal of Food Science, 68, 2538e2541
5. Chegini. G. R,&Ghobadian, B. (2005). Effect of spray-drying conditions on physical properties of orange juice powder. Drying Technology, 23, 657e668.
6. Klaenhammer, T. R. (2000). Probiotic bacteria: today and tomorrow.