

Technological and economical studies on production of date powder and paste from some low quality Egyptian dates

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Abstract

The aim of this work was to utilize the low quality date palm (prishible soft date and seedling of dry dates) to produce date paste and date powder, respectively. Amhat; a cultivar soft variety was used at rutab stage for producing date paste, while the dry dates were used for producing date powder by applying simple technology. These two products can be easily handled, transported, and utilized. They are shelf stable so that can be available all the year round for making many food products.

The date paste production percentage from Amhat cultivar was 40-42%. Chemical composition of date paste was: 24.48% moisture, 61.97% total sugars, 2.04% protein, 1.97% fibers and 1.05% ash. The estimated date powder production percentage from the dry date seedling cultivar was 50-55%. The chemical analysis showed that date powder contains: 8.9% moisture, 80.67% total sugars, 2.20% protein, 2.59% fibers and 1.46 ash. The economical evaluation of the study indicated the feasibility of investment in production of date paste, date powder and date pits powder because it had internal rate of return of 28.5 %, which exceeds the posted bank interest value. In addition, the percentage of return to costs was 4.44% and the percentage of return to investment was 19.1%. The overhead invested in the study can be regained within two years and two months.

Key words: Date, paste, powder, feasibility, economic.

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Introduction

Date palm fruit (*Phoenix dactylifera* L.) is considered one of the most important fruit in the arid and semi-arid land. In Egypt, the total area cultivated with date palm is 115.6 thousand Feddans which produce 1.68 million tons of date fruits (Ministry of Agriculture and Land Reclamation, 2015). This amount represents 15.1 % of total production of Egyptian fruits (11.15 M tons). Only 16.5% of total date fruit production (278 thousand tons) was directed for food processing. Most of date processing plants are ordinary date packing houses where good quality dates are prepared and packaged for export or for local market with minimal processing operations. The amount of waste from date fruits was 331 thousand tons which represent about 19.6% of total date fruit production in Egypt (Ministry of Agriculture and Land Reclamation, 2015).

Date palm cultivars can be classified into three main types (Kader and Hussein, 2009) according to their fruit moisture content. The three stages of date fruit ripening are khalal (biser), rutab and tamar (Kassem 2012). The chemical composition of dates is

variable due to various factors such as cultivar, region, climate, amount of fertilization and type of agricultural practices (Al-Rawahi et al. 2005).

Date palms in Egypt and their fruit characteristics and chemical composition have received the attention of many researchers (Selim et al., 1968, Amer and Zahran, 1999, Hussein et al., 2010, Riad 1996, Sakr et al., 2010, and Bekheet, 2013). The nutritional value of date fruits and date pits has been evaluated for many varieties (Habib and Ibrahim, 2009 and El-Sohaimy and Hafez 2010).

Abdalla et al. (1996) cited that commercial grading of dates is based principally on the physical characteristics and general appearance of the fruit, moisture and sugars contents. Moreover, Youssef et al. (1999) evaluated the chemical composition of 8 date cultivars from different areas of Upper Egypt. Total sugars contents ranged from 73.65% to 81.77% for dry cultivars and from 75.10% to 87.27% for semi-dry cultivars. Non-reducing sugars (41.85%-46.52 %) were the dominant sugars of dry cultivars, while reducing sugars (71.83%- 79.08%) were present in high amounts in the semi-dry cultivars.

Aswan governorate is one of the important areas in Egypt for producing dry cultivars (Hussein et al., 1979). The dried dates have a large percentage of sucrose up to 80%, whereas the soft dates are rich in glucose and fructose (Bekheet, and El-Sharabasy, 2015). There is a small amount of fiber, protein, vitamins and minerals.

Abd-El Hamed et al., (2017) evaluated some physical and chemical attributes of groups of seedling cultivations. The clustering dendrogram exhibited strong relationship between evaluated seedling palm trees and varieties found in their nearby locations according to their fruit physical and chemical characteristics.

Egyptian famous date varieties can be classified, according to their moisture content besides some other characteristics, into soft dates (Zaghloul, Amhat, Hayany, Bent Aisha, Samany, Oraiby and Om Elferakh), semi-dry dates (Siwi, Saidy, Amry , and Aglany) and dry dates (Sakkoty, Malkaby, Gondella, Partimoda and Tamar). Seedling and meghals dates can be also classified similarly. Usually, the characteristics of such seedling will match the most abundant variety found in their nearby locations (Abd-El Hamed et al., 2017).

According to El-Sharabasy (2017), early ripening varieties are Saidy (beginning of August), Amhat and Haiani (Middle of August), and Siwi (beginning of September); whereas Zaghloul, Samany and most dry date varieties appear in the market at the midseason (middle of September). Late varieties such as Bent Aisha, Oraiby, and Om Elferakh appear in the market at beginning, middle and end of November; respectively.

Soft dates which are consumed at the Khalal or Rutab stages (El-Sharabasy and Rizk, (2005) are perishable having short marketing life unless kept frozen which is expensive. Semi-dry varieties have a relatively longer shelf life, but have to be kept refrigerated. Dry dates can be kept safe in cool dry storage rooms for longer periods.

Processing of semi-dry dates into Agwa (pressed whole dates) or date paste (minced pitted dates) can prolong their market availability, however, the demand on exporting the semi-dry date varieties is increasing, so that processing soft dates such as Amhat or other soft dates into date paste is the only available alternative.

Dry date varieties such as Sakkoty, Malkaby, Gondella, Partimoda and tamar have good marketing value and high grade due to their quality, however, many dry date seedlings are of low grade and low marketing prices. Processing these low-grade dry

dates into date powder adds value and widens the scope of utilization in the food processing industries. Date powder can partially replace sugar in many food recipes. It can be utilized in making soft drinks, bakery, confectionary and others. If properly packaged, date powder can be shelf stable and made available all the year round.

This work was carried out to utilize some of the low quality dates (prishible soft dates, seedling of dry dates) to produce date paste and date powder, respectively. In addition, economical evaluation of the whole process was conducted in order to evaluate the feasibility of investment in these activities.

Materials and Methods

Materials

This study was carried out during 2016 and 2017 season's using fruits from 30 years old Amhat date palms grown on loamy soil at Abo Rawash district at Giza governorate. Fruits of seedling of dry dates were obtained from Aswan governorate. All chemicals were of analytical grade and obtained from Al-Gamhoria Company.

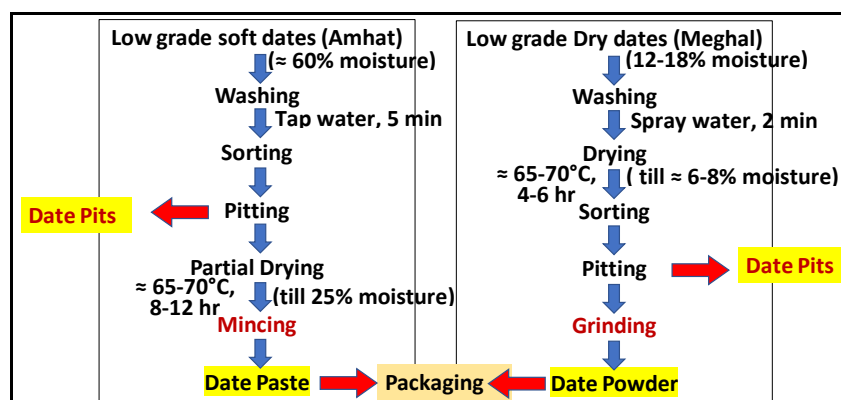
The packaging materials were obtained from Cairo Trade Co. at 6th October city, Giza. It was preformed sealable bags of 40x60 cm in dimensions made of transparent polyamide/polyethylene (PA/PE) of 160 μ in thickness.

Methods

Processing methods

The processing steps for producing date paste and date powder from low grade dates are illustrated in Figure (1). The available facilities and equipment in the dates packing house were utilized in these two processes. Only a grinder is needed for mincing the flesh of dehydrated, pitted soft dates into paste. Also, a milling machine is needed for grinding the dehydrated flesh of pitted dry dates into powder. In addition, a date pitting machine and a vacuum packaging machine are needed to complete the two processing lines.

Fig. (1): Processing low grade dates into date paste and date powder



In the food industry, unit operation allows easily construction of many processing lines just by rotating the available equipment. The date pitting, grinder, milling and packaging machines are movable so that the proper processing line can be assembled or

disassembled as needed. Thereby, these new added machines can be operated stand alone or work in concert with the other equipment in the packing house.

Analytical methods

Total soluble solids (TSS), total acidity as malic acid, moisture, ash, protein, total lipids, crude fiber, total soluble sugars, reducing and non-reducing sugars contents were determined following the methods of A.O.A.C (2005).

The pre-feasibility study

The investment in upgrading an old packing house to be able to produce date paste and date powder was evaluated in accordance with Gittinger, (1973).

Results and Discussion

Technical aspect of the date paste and powder processing

1. Raw materials and yield of final products:

- a. The soft date cultivar, Amhat: The capacity for producing date paste from Amhat was found to be two tons/day which yielded 800 kg (yield = 40-42%). The process was illustrated in Figure (1). The produced amount of date paste was packaged in 160 μ PA/PE packages (5 Kg/pack) sealed under vacuum and kept refrigerated.
- b. The seedling dry dates: Two tons per day of the dry date fruits were processed (Figure 1) into 1000 kg date powder (yield = 50-55%). The produced amount of date powder was packaged in 160 μ PA/PE packages (5 Kg/pack) sealed under vacuum and kept refrigerated.

2. Equipment and process requirement:

As mentioned earlier, the two new processing lines were intended to upgrade the already exists date packing house and are operated in cooperation with the already available equipment. The cost of utilizing the packing house available equipment and facilities are used in calculation the total costs and expenses of producing the final date paste or powder. The location has washing and rinsing equipment, sorting tables, dehydration oven and packaging area set up. The process of producing date paste requires addition to the packing house available equipment and facilities, a date pitting machine, a date mincing machine (electric grinder), and a manual press for rectangular slab formation of date paste. An under vacuum packing machine is also needed instead of the manual sealing machine. Amhat date flesh (about 60% moisture) has to be dehydrated to about 25% moisture before grinding. The dehydration process may require the drying oven for 8-12 hours at 65-70 °C.

- a. The process of producing date powder requires – in addition to the packing house available equipment and facilities – a date pitting machine, a dehydrated date flesh milling machine (A high capacity hammer mill), and an under vacuum packing machine. The date pitting and vacuum packaging machines used in making date paste can be used in the process

of making date powder. The distance between two the cylinders of the pitting machine was narrowed to enable separation of the dry flesh from the pits. Flesh of dry date seedling (about 12-18% moisture) has to be dehydrated to about to 6-8% moisture before grinding. The dehydration process requires using the drying oven for 4-6 hours at 65-70 °C.

- b. Low grade dates produced at the date packing house when sorting high grade dates for export or local market can be used for making either date paste or powder depending on the characteristics of the available date fruits. The output of such sorting process which earlier was considered losses, can be converted now into valuable final product; paste or powder.
- c. It should be noted that date pits produced during making date paste and powder can be cleaned and dehydrated then milled into meal of different particle sizes (through using sieves of different meshes) and packaged in 50 kg packs. The date pit meal has various uses; making animal feeds, fermentation/transformation industries for producing ethanol, vinegar, glycerin etc., for making imitative non-caffeine coffee; or pit oil extraction for pharmacopeia applications.
- d. It should be mentioned here that the produced date paste and date powder are intended for human consumption, thereby, food safety and processing sanitary are observed during the whole processing, storage, handling and transport activities. Metals, chemicals or biological contaminants should be avoided. All food contact materials and surfaces should be inspected and monitored for cleanliness and safety. Any health hazard has to be completely eliminated or discarded.

3. The human resources:

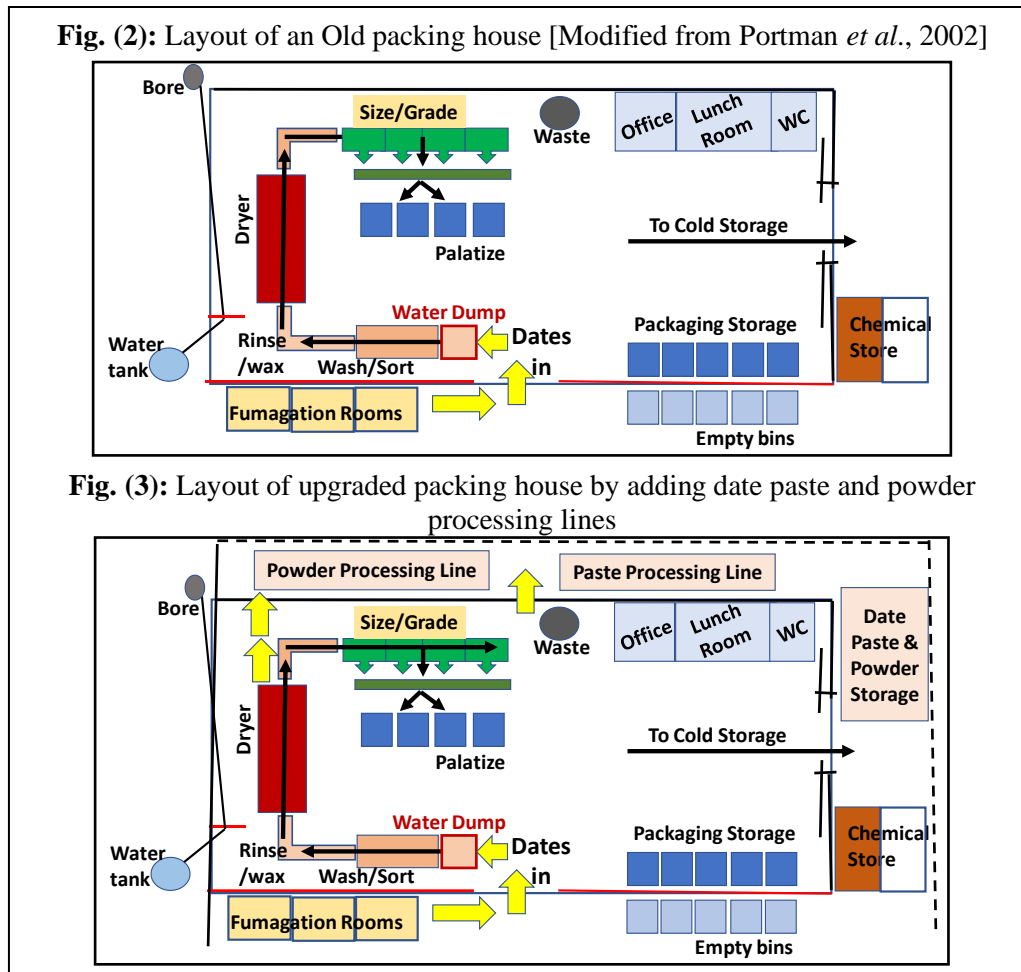
For operating both processing lines, 16 jobs were created; a general manager (has management experience; intermediate certificate), a production manager (has processing experience and qualified for the job), two technical workers (have machine operation and maintenance experience, 8 production workers (have intermediate certificate) and 4 loading workers. The production activities for sorting and packaging can be assigned to women if permits.

4. Equipment specifications:

All new equipment (pitting, grinding, milling and packaging machines) should operate at least 250 kg/hour. These enable processing of two tons raw materials per day. The limiting step in the whole process is the dehydration in the drying oven which can be operated over night for the required time in order to achieve the appropriate moisture content of date flesh suitable for the following step. Some of these machines may require a 3 phase power source which is already available at the packing house. Washing of incoming dates or the processed date pits (preferable by sprinkling water) require drainage which is already available at the date packing house.

Milling of dehydrated pitted dates or date pits into powder requires dry cool environment because the free flowing, fine powder is highly hygroscopic so that it absorbs moisture from the surrounding air quickly and turns into lumps. To avoid this, anti-caking agent may be used during milling or milling should be done under cooling conditions followed by vacuum packaging as quickly as possible into moisture- and air-proof (PA/PE) packages.

Figures (2 and 3) illustrate the layout of an ordinary date packing house (modified from Portman *et al.*, 2002) before and after upgrading through adding the new processing



lines. The regular activities at the ordinary date packing house can be described as follows: After receiving the coming dates, a disinfection/fumigation treatment is applied outside the processing area.

Then, dates enter the processing area to be washed, sorted, graded and may receive a dehydration treatment before packaging into boxes of different sizes according to the required weight or volume. Marking and palletizing equipment are used before sending the finished pallets to the storage facilities to be ready for export or for the local market on demand. Other processes may take place at the packing besides disinfection

and curing of received dates. Some packing houses may compress the semi-dry varieties such as Siwi dates into blocks of various shapes (Agwa) or press into metal containers. The high sugar content and low moisture content are good enough for preserving pressed dates against bacterial and mold attack. The process delays date darkening by the atmospheric oxygen. The location at any packing house permits accommodation of the new coming equipment. The mutual benefits for both the new added two lines and the original packing house encourage coordination and cooperation of both.

Chemical characteristics of raw materials and products of dates

Table (1) summarizes the chemical characteristics of raw materials (The soft date cultivar; Amhat at rutab stage and the seedling of dry date) and final products; date paste and date powder.

Table (1) Chemical characteristics of raw materials and products of dates (on fresh weight bases)

Properties	Amhat fresh date	Amhat date paste	Seedling of dry date	Seedling dry date powder
Moisture content (%)	55.43	24.48	14.01	8.90
pH value	6.63	6.55	5.97	5.56
Acidity (%)	0.175	0.291	0.436	0.452
Protein (%)	1.22	2.04	2.15	2.20
Reducing sugars (%)	35.11	61.23	26.72	35.55
Non-reducing sugars (%)	1.69	0.74	50.29	45.12
Total sugars (%)	36.80	61.97	77.01	80.67
Lipids (%)	0.66	1.01	0.95	0.98
Crude fibre (%)	1.22	1.97	2.54	2.59
Ash (%)	0.64	1.05	1.40	1.46

The flesh of Amhat cultivar had 55.43% moisture content, whereas after processing, the chemical composition of date paste showed 24.48% moisture, 61.97% total sugars, 2.04% protein, 1.97% fibers, 1.05% ash (on the fresh weight bases). On the other hand, the flesh of the dry seedling variety had 14.01% moisture content. The date powder showed 8.9% moisture, 80.67% total sugars, 2.20% protein, 2.59% fibers and 1.46% ash (on the fresh weight bases). These results were in agreement with those reported by Salem and Hegazi (1971) for dry dates and by El-Sharnouby *et al.*, 2007, for date powder, and by Ahmed *et al.*, (2012) and Abd El-Migeed, *et al.*, (2013) for soft dates and by Mrabet *et al.*, (2008) for date paste.

Pre-Feasibility study for the investment in upgrading the packing house:

This investment study can be established at the dates packing plants (specialized for sorting, grading, and packing of dates) located in some governorates such as Aswan, Giza, Fayoum, El Sharqia, and Oases because they are centers of production of the raw materials. It requires the establishment of units for production of date paste, date powder and date pit powder (feed for animals), which relies on processing of low-quality dates, which is a by-product of the date packing plants (specialized for sorting, grading and packing of dates). The financial study for the implementation of this study included the following elements; in accordance with Gittinger (1973).

Table (2) presents the value of general and administrative expenses of the investment during the first year which amounted to LE 116.908 thousand, with an annual increase of about 10% during the life cycle (5 years) of the investment.

Table (2) General and administrative expenses of this investment (within five years)

(Value = L.E Thousand)

No.	Expenses items	Year				
		First	Second	Third	Fourth	Fifth
1	Rentals	12.000	12.600	13.230	13.892	14.586
2	Lighting, electricity, energy and water	12.000	12.240	12.485	12.734	12.989
3	Transportation and Transport (Pickup truck)	24.000	25.200	26.460	27.783	29.172
4	Hospitality	2.500	2.550	2.601	2.653	2.706
5	Depreciation of long-term assets	42.075	42.075	42.075	42.075	42.075
6	Costs for the establishment*	13.333	13.333	13.333	---	---
7	(Professional fees)	1.000	1.100	1.210	1.331	1.464
8	Communications and Telephones	2.500	2.625	2.756	2.894	3.039
9	Other tools and accessories	5.000	5.250	5.513	5.788	6.078
10	Office supplies & publications	2.500	2.625	2.756	2.894	3.039
Total		116.908	119.598	122.419	112.044	115.148

(*) Costs for the establishment are distributed on first 3 years only.

The fixed assets of this investment were estimated at LE 813 thousand with an annual depreciation rate of LE 42.075 thousand as shown in Table (3). The processing lines for production of date paste, date powder and date pits powder can be assembled according to the desired operation. The date pitting machine can be adjusted to remove the seeds from either the soft or the dry dates. The hummer mill can be utilized in producing powders of different particle sizes from dehydrated date flesh or date pits. The vacuum packaging machine can be used for packaging any of the three final products using different packaging materials and at different sizes.

Considering that the investment will operate at capacity of about 70%, the annual direct and indirect production inputs (Table 4) amounted to LE 3.356 million in the first year of the investment. This value is not very high when sales and contracts of the final products take place at the mean time.

Table (3) Investment requirements of fixed assets

Assets names	Productive age	Expected value of asset after 5 years (L.E Thousand)	Number of units	Unit price (L.E Thousand)	Total value (L.E Thousand)	Annual losses (L.E Thousand)
Pallet balance	10	3.200	2	16.000	32.000	2.880
500 L stainless steel washbasins	10	4.000	5	8.000	40.000	3.600
Stainless steel tables for sorting	10	5.000	10	5.000	50.000	4.500
Date paste production line (pitting machine - conveyor belt - grinding machine)	20	25.000	1	250.000	250.000	11.250
Hydraulic piston for dates and paste	20	8.500	1	85.000	85.000	3.825
Powder production lines for dates or date pits (Mill - Feed Mixing Machine – sacks Packing Machine)	20	26.000	1	260.000	260.000	11.700
Vacuum packaging Machine (for Date Powder)	20	8.000	1	80.000	80.000	3.600
Semi-automatic palletizing machine	20	1.600	1	16.000	16.000	720
Total		81.300			813.000	42.075

The investment provides 16 permanent job opportunities at LE 34 thousand per month for 12 months. The annual cost of employment component is about LE 408 thousand annually with an annual increase of about 10% as shown in Table (5). Women have the opportunity for employment to do sorting and packaging activities; up to eight jobs are available if possible.

Table (6) indicates that the cost of the investment is about LE 4.679 million in the first year of the investment life. Table (7) shown that the investment can be producing 90, 115, and 70 tons of date paste, date powder, and date pit powder, with an average unit price of LE 16, 25, and 8 thousand per ton respectively.

Table (4) Annual production requirements

Name of items and description	Quantity	Unit	Unit cost (L.E Thousand)	Total (L.E Thousand)
Fresh soft dates (rutab)	150	Ton	4.000	600.000
Dry date seedling fruit	150	Ton	8.000	2400.000
The cost of washing and drying one ton on the machines and equipment of the original factory	450	Ton	0.500	225.000
Carton (20 kg package)	205	Unit	0.250	51.250
Packaging materials for date paste and date powder	205	Ton	0.150	30.750
Packaging materials for date pits powder	75	20 sacks /ton	0.060	4.500
Storage and cooling expenses (rent of 25 tons refrigerator)	9	Month	5.000	45.000
Total				3356.500

Table (5) Direct and indirect employment

No.	Job	Number	Qualifications	Average monthly wage (L.E Thousand)	Total monthly wages (L.E Thousand)	Annual payment (L.E Thousand)
1	General manager	1	Employer (Intermediate certificate)	4.000	4.000	48.000
2	Production manager	1	Qualified for the job	3.000	3.000	36.000
3	Technical worker	2	Equipment operation & maintenance	2.500	5.000	60.000
4	Production workers	8	Sorting/packing, Intermediate certificate	2.000	16.000	192.000
5	Loading workers	4	With/without Intermediate certificate	1.500	6.000	72.000
Total		16		13.000	34.000	408.000

Table (6) Total investment costs

Operational costs in the first year	First year (L.E Thousand)	Monthly (L.E Thousand)	Cycle duration (months)	Costs (L.E Thousand)
Costs of production requirements	3356.500	279.708	12	3356.500
Labor costs	408.000	34.000	12	408.000
General and administrative expenses for the first year (Without Depreciation and Establishment Costs)	61.500	5.125	12	61.500
Total operating costs				3826.000
Pre-operating expenses (For establishment)				40.000
Fixed asset costs				813.000
Total investment costs				4679.000

Table (7) Sales expected in the first year of the investment

Product Type – Service	Unit	Quantity	Expected unit price (L.E Thousand)	Value of total annual sales (L.E Thousand)
Dates paste	Ton	90	16.000	1440.000
Powder of dates	Ton	115	25.000	2875.000
Dates kernel powder	Ton	70	8.000	560.000
Total sales	Ton	275	---	4875.000

Table (8) Estimated annual income statement during the lifetime of the investment

(Value = L.E Thousand)

Item	Year				
	First	Second	Third	Fourth	Fifth
Sales	4875.000	5898.750	7137,488	8636.360	10449.995
Cost of production inputs	3356.500	3876.758	4477.655	5171.691	5973.304
Labor cost	408.000	448.800	493.680	543.048	597.353
Gross profit	1110.500	1573.193	2166.153	2921.620	3879.339
General and administrative expenses	116.908	119,598	122,419	112.044	115.148
Net income without taxes	993.592	1453.594	2043.733	2809.576	3764.191
Taxes	99.359	145.359	204.373	280.958	376.419
Net income plus taxes	894.233	1308.235	1839.360	2528.619	3387.772

To evaluate this investment over its life cycle of 5 years; Table (8) summarizes the estimated annual income. The estimated annual income statement for the first year of the investment shows that the total number of units expected to be produced is 275 tons. The expected sales value for the first year is estimated at LE 4.875 million with a total profit of LE 1.110 million and a net profit (after tax deduction) of LE 894 thousand (Table 8).

The expected sales volume in the fifth year of production (Table 8) was estimated at 403 tons with expected sales of LE 10.445 million with a total profit of LE 3.879 million and net profit (after deduction of taxes) of LE 3.388 million. The gross profit margin was 22.78%, net profit margin was 18.34 %, Expenses attributed to sales are 4.44%, and the average overall profit margin of the unit of the final products (one ton) was LE 4038.

The current prefeasibility study deduced some important economic indicators for investment such as: the net current value of the investment at the discount rate (25%) was about LE 297.882 thousand with internal revenue of return (IRR) rate of about 28.5% and

a recovery period of about two years and two months. In addition, percentage of return to costs was 4.44% and percentage of return to investment was 19.1%.

Conclusion

The financial analysis of this investment indicates positive results encouraging investment in this field. The investment produces shelf stable date paste and powder of high quality and added value; both products have many applications in the food industry. The investment produces date pits powder/meal for varietal of industrial uses and animal feeding applications. The investment utilizes low grade dates remain after preparation of high grade dates for valuable export or rewarding local market. The investment, through simple processing techniques, reduces losses of perishable soft dates when refrigerated storage are expensive or not available. These losses have negative impact on the environment. The investment adds a high value to the dry dates of inferior quality when utilizes simple processing technique for producing shelf stable date powder that has varietal applications in the food industry. For the food processing industry, it is easier to handle, store, transport, mix and quantify date powder and paste. The investment provides new jobs for both genders. Utilizing date paste and powder in many products of the food industry enhances the nutritional values of these products which will have good impact on the health of the community.

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دراسات تكنولوجية و اقتصادية لإنتاج مسحوق ومعجون التمر من بعض الاصناف المصرية منخفضة الجودة

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الملخص

يهدف هذا العمل الى الاستفادة من التمور منخفضة الجودة (سرعة التلف، ثمار بذرية جافة) في إنتاج مسحوق ومعجون التمر. فقد تم استخدام ثمار بلح الأمهات في مرحلة الرطب في إنتاج معجون التمر وكذلك استخدام ثمار البلح الجافة البذرية في إنتاج مسحوق التمر بتطبيق طرق تكنولوجية مبسطة. ويتميز كل من مسحوق ومعجون التمر بسهولة في النقل والتداول والاستخدام، ويقدر تخزينية أعلى وبالتالي فترة تسويقية اطول بالمقارنة بأصناف التمور التي استخدمت في إنتاجها. وبالتالي يمكن استخدامها على مدار العام في العديد من المنتجات الغذائية.

وقد أوضحت النتائج ان نسبة تصافي إنتاج معجون التمر من صنف الامهات حوالي 40-42%. وقد احتوى معجون التمر الناتج على 24.48% رطوبة و 61.97% سكريات كلية و 2.04% بروتين و 1.97% ألياف و 1.05% رماد. كما أظهرت النتائج أن نسبة تصافي إنتاج مسحوق التمر من الثمار الجافة البذرية حوالي 50-55%، وقد احتوى المسحوق على 8.90% رطوبة، و 80.67% سكريات كلية و 2.20% بروتين و 2.59% ألياف و 1.46% رماد.

وبالنسبة للجوانب الاقتصادية للدراسة، فقد أظهرت نتائج دراسة الجدوى المبدئية لتصنيع معجون ومسحوق التمر ربحية الاستثمار في هذا المجال حيث ان معدل العائد الداخلي لهذا الاستثمار 28.5% وهو يتجاوز الفائدة البنكية المعلنة. كما ان نسبة العائد الى التكاليف تمثل 4.44%، ونسبة العائد للاستثمارات 19.1%، ويمكن استرداد رأس المال لهذا الاستثمار في فترة سنتين وشهرين.

الكلمات الدالة: التمر، معجون التمر، بودرة التمر، الجدوى الاقتصادية