

Good Manufacturing Practices (GMP) during the Production of Mango Juice and Mango Pulp

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ABSTRACT

Fifty five sample (40 sample from juices and 15 swab) collected from juices company in Cairo that were examined during the application of Good Manufacturing Practices (GMP) of mango juices and mango pulp included swabs of the food handlers, equipment and walls. The aerobic total count was 3×10^3 cfu from wall, 5×10^3 cfu from food handlers and was 5×10^4 from equipment coliform count was 3×10^3 from wall, 2×10^3 cfu from food handler and 5×10^5 from equipment while mold and yeast was 5×10^5 from walls, 3×10^4 from food handlers and 5×10^4 from equipment. After application of those practices, the samples from mango juices and mango pulp became safe and free from pathogenic microorganisms. Also, the results show the final products were safe.

Key words: *manufacturing practices- mango juice - mango pulp*

INTRODUCTION:

The international standard specifies the requirements for food safety management system where an organization in the food chain needs to demonstrate its ability to control food safety hazards in order to ensure that the food is safe at the time of human consumption. This international standard specifies requirements to enable an organization such as food safety policy, providing products that, according to their intended use, prerequisite programme, operational PRP, critical control point, critical limit, monitoring, corrective action validation, verification system management shall ensure that planning of food safety system is carried out to meet the requirements as well as the objectives of the organization that support food safety, ensure that responsibilities and authorities are defined and communicated within the

organization to ensure the effective operation and maintenance of the food safety management system (*Kassem M.M. 2000*) and (*kassem et al 2010*).

Food safety team leader

A Food safety team leader, irrespective of other responsibilities, shall have the responsibility and authority to manage a food safety team and organize the work to ensure that the food safety management system is established, implemented, maintained and updated (**ISO 22000 2005**).

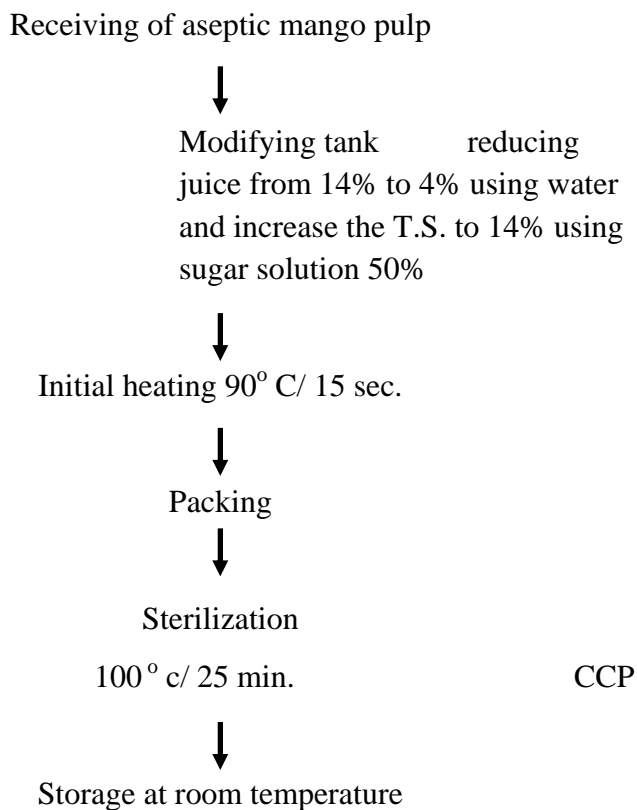
MATERIAL & METHODS

This study was carried out at a juices company in Cairo. The study at the company was done over a period of 5 months. Visit intervals were two days per week on 40 samples from juices and 15 swabs.

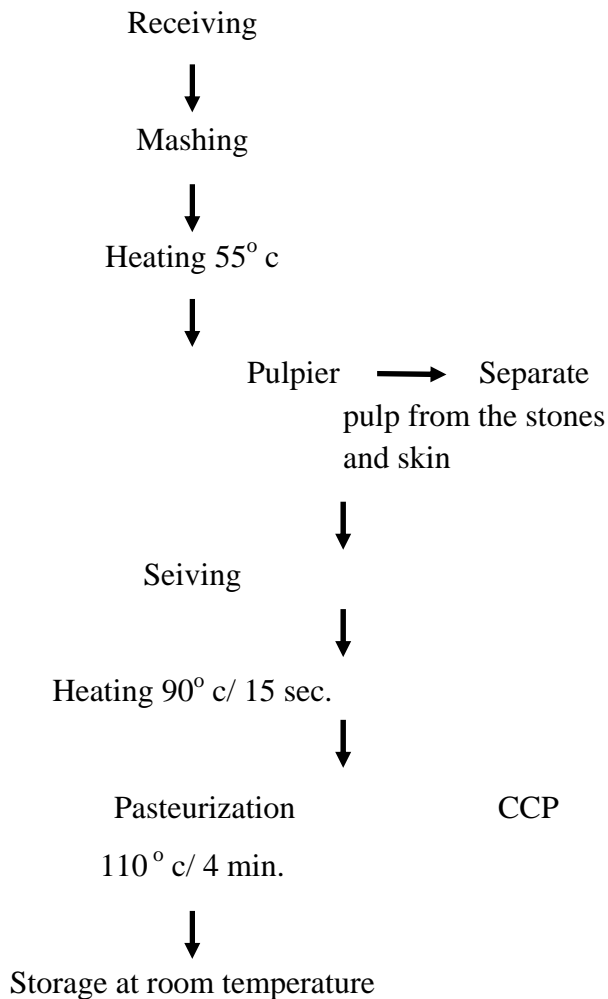
The main objectives of the study were as follows:

1. Evaluation of the microbiological quality of the juices and pulps of mango before the application of GMP.
2. Swabs from workers (food handlers), equipment and walls were taken at the production lines.
3. Application of GMP at the plant.
4. Evaluation of the microbiological quality of the juices and pulps of mango after the application of GMP:-
 - Evaluation of the microbiological quality through the samples taken from the plant to evaluate the microorganism's examination, before and after the application of GMP (**ICMSF, 1978**).
 - Assembly of the food safety leader with the production manager, engineer, consultant of microbiology and food hygienist.
 - Construction of flow diagrams: Each step in the process was outlined in sequence in the flow diagram from receiving to the final product. Samples were taken in sterile bags on ice box until they reached the laboratory. The microbiological procedures were those recommended by the International Commission in Microbiological Specification for Foods (**ICMSF 1978 & 1995**).

Flow diagram (1): The production of mango juice



Flow diagram (2): The production of mango pulp



RESULTS & DISCUSSION

Table (1) illustrates the microbial count of mango juices before (GMP) application. It can be seen from the table that the microbial count was higher in all the steps from receiving to the storage stages.

Tables (2 & 3) show the hazard analysis and preventive measures of the production of mango juice. It can be seen from the table that the hazards were high loads of microorganisms. In most of the steps, the low load in the sterilization steps after that the microorganisms, beamed recontamination because the sterilization was inadequate in the temperature degree and inadequate time. Also the table shows the preventive measures were adequate clean and safe tank, cans and utensils as well as the cleaning of the environment from dust and straw. **Kassem et al (2010)**, who reported that

microorganisms as *staphylococcus aureus* was found to survive at sterilization degree. Also could be attributed to poor hygienic conditions and lack of sanitation.

Table (4) shows the microbial count of the swab samples taken from different production lines at the plant. It can be seen from the table that the swabs were taken from walls, food handlers and equipment. The table shows growth of aerobic count in all the swabs. The table also shows growth of coliform and mold and yeast in all the swabs, no growth of anaerobic count in all the swabs, while the *staph.*, was found in the swabs from food handlers only, **El-Tawil (2001)** noticed that the monitoring of CCP is essential to ensure that the specific criteria are being met. Monitoring procedures were implemented through the HACCP team to ensure that all CCPs were under control.

Table (5) shows the microbial count in the random samples taken from the final products in the mango juice and mango pulp. It can be seen from the table that there's now growth of all M.O.S. in the products.

Table (6): count was found in the low load in the M.O.S. in the initial stages, while there was no growth in both pasteurization and storage steps. **El-Tawila (1998)** also reported that the decrease in the microbial count after HACCP system application indicated its successful application at food establishments.

Table (7): shows that the count was found in the low load in the M.O.S. in the initial stages, while there was no growth in both Sterilization and Storage.

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(Table 1): Microbiological examination during production of mango juice before (GMP) application

Step	Aerobic total count	Anaerobic total count	Staph. aureus	Coliform	Mold/yeast
Receiving	25×10^5	10×10^6	2×10^3	-ve	2×10^5
Modifying	5×10^{10}	6×10^7	8×10^4	<1100	2×10^7
Packing	5×10^{10}	7×10^7	9×10^4	<1100	3×10^7
Sterilization	2×10^2	5×10^2	2×10^2	-ve	-ve
Storage	2×10^3	3×10^3	2×10^2	-ve	2×10^2

Table (2): Microbiological examination during the production of mango pulp before (GMP) application

Step	Aerobic total count	Anaerobic total count	Staph. aureus	Coliform	Mold/yeast
Pulper	5×10^{10}	3.0×10^{10}	2×10^4	1100	7.0×10^9
Sieving	5×10^{10}	3.0×10^{11}	3×10^5	1100	8×10^{10}
Heating	3×10^7	3×10^8	2×10^4	1100	5×10^6
Pasteurization	3.0×10^4	2×10^5	1×10^2	-ve	-ve
Storage	5×10^5	2×10^6	1×10^3	-ve	5×10^3

(Table 3): Hazard analysis chart of mango juice production

Step	Hazard	Preventive measures
Receiving	<ul style="list-style-type: none">• High loads of microorganisms.• Cross examination from food handlers• Environmental contamination	<ul style="list-style-type: none">• Personal hygiene of the food handlers• Use clean and safe utensils and vehicle tanks
Modifying	<ul style="list-style-type: none">• Increasing of microorganisms. count• Cross examination from environment• Inadequate removal of dust and straw	<ul style="list-style-type: none">• Use clean and safe modifying tanks• Adequate removal of dust and straw
Packing	<ul style="list-style-type: none">• As above	<ul style="list-style-type: none">• As above
Sterilization	<ul style="list-style-type: none">• Inefficiency of Sterilization stage	<ul style="list-style-type: none">• Control of temperature degrees in this step• Disinfection of the cans
Storage	<ul style="list-style-type: none">• Recontamination with some microorganisms.• Environmental contamination	<ul style="list-style-type: none">• Adequate cleaning of the environment and cans

Table (4): The Microbial counts of the swab samples taken from different production lines at the plant

Microbial Test	Walls	Food handlers	Equipment
Aerobic total count	3×10^3	5×10^3	5×10^4
anaerobic total count	< 10	< 10	< 10
Staph.	-ve	2×10^2	-ve
Coliform	3×10^2	2×10^3	5×10^5
Mold/yeast	5×10^5	3×10^4	5×10^4

Table (5): The Microbial count of random samples in final product during the production of mango juice and mango pulp taken after (GMP) application at the plant

Step	Aerobic total count	Anaerobic total count	Staph. aureus	Coliform	Mold/yeast
Mango juice	<30	<10	-ve	-ve	-ve
Mango pulp	<30	<10	-ve	-ve	-ve

Table (6): Microbiological examination during the production of mango juice after (GMP) application

Step	Aerobic total count	Anaerobic total count	Staph. aureus	Coliform	Mold/yeast
Receiving	5×10^2	200	1×10^2	-ve	1×10^2
Modifying	5×10^2	200	1×10^2	-ve	2×10^2
Packing	5×10^2	200	1×10^3	-ve	2×10^3
Sterilization	-ve	-ve	-ve	-ve	-ve
Storage	-ve	-ve	-ve	-ve	-ve

Table (7): Microbiological examination during the production of mango pulp before (GMP) application

Step	Aerobic total count	Anaerobic total count	Staph. aureus	Coliform	Mold/yeast
Pulper	5×10^5	3×10^5	2×10^2	-ve	8×10^3
Sieving	5×10^5	3×10^5	2×10^3	-ve	8×10^3
Heating	2×10^3	2×10^4	2×10^2	-ve	3×10^2
Pasteurization	-ve	-ve	-ve	-ve	-ve
Storage	-ve	-ve	-ve	-ve	-ve

الممارسات التصنيعية الجيدة خلال إنتاج مركزات وعصائر المانجو

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تم تفعيل كل الممارسات التصنيعية الجيدة أثناء إنتاج وتصنيع عصائر ومركزات المانجو بشركة لأنتاج العصائر بالقاهرة وكانت عدد العينات 55 (40 عينة بالإضافة إلى 15 مسحات) والتي تضمنت صحة وسلامة العاملين بخط الإنتاج و الأدوات المستخدمة و مكان التصنيع والمواد المضافة أثناء عملية التصنيع، وقد اتضح بعد تطبيق هذه الممارسات الجيدة من أن المستعمرات البكتيرية لم تتواجد وأحياناً أخرى متواجدة بأعداد قليلة لا تؤثر في سلامة وصحة المنتج النهائي و أظهرت النتائج نمو بكتيري في بعض المسحات فكان العدد البكتيري 10×3^3 و 10×5^3 و 10×5^4 من كل من الحواط والعمال والاجهزة على الترتيب. والمجموعة القولونية كانت 10×3^3 و 10×2^3 و 10×5^5 على الترتيب في حين ان العد الكلى للخمائر والفطريات كانت 10×5^5 و 10×3^4 و 10×5^4 على الترتيب. لم تتواجد هذه المستعمرات البكتيرية في حالات البسترة والتعقيم والتخزين وهي المراحل الأخيرة من عملية الإنتاج ليصبح المنتج النهائي آمناً. وقد تضمن البحث أيضاً أخذ عينات من المنتج النهائي بعد تفعيل هذه الممارسات الجيدة والتي أكدت أن جميع العينات التي تم أخذها وتحليلها ميكروبيولوجياً خالية من هذه الملوثات ومطابقة تماماً للمواصفات المصرية القياسية.

الكلمات المفتاحية: ممارسات التصنيع – عصير المانجو – لب المانجو