Postharvest practices used by summer vegetable farmers in AL-Qassim District, Babylon Province, Iraq

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ABSTRACT

Post-harvest practices played an important role in maintaining quality and extending shelf life of vegetable. study of post- harvest practices used by vegetable farmers can provide crucial information that help in in improving and maintaining the quality of vegetable. The study was conducted in AL-Qassim District, Babylon Province, Iraq, to investigates the post- harvest practices used by summer vegetable farmers. Two hundred and fifty summer vegetable farmers were randomly selected. Most of respondents harvest their crops at full ripe stage, leave their crops out in the sun, carry out the sorting process, don't grading their crops, pack their crops in plastic bags, use an open vehicle as a mode of transport, and marketing their crop at morning. An effective agricultural extension strategy is needed to diffusion modern and effective post-harvest practices.

keywords: handling; harvesting; Iraq; shelf live; vegetable.

Introduction

Vegetables are annual or perennial horticultural crops, with certain sections (roots, stalks,
flowers, fruits, leaves, etc.) that can be consumed wholly or partially, cooked or raw (Pathak , 2022). Vegetables are an important role in human nutrition due to their special sensory properties and the precious nutritional elements they contain: carbohydrates, enzymes, organic acids, vitamins and mineral salts(Giulia and Monica, 2022).

Vegetables play an important role in promoting household food security and provide a sustainable solution to micronutrient malnutrition which is affecting the human health, and its production generates employment and income of small scale farmers(Singh et al., 2019).

There is an increasing demand for agricultural crops, including vegetables, that offset by a shortage in the supply of agricultural crops, which is due to several reasons, including crop loss, especially post-harvest. FAO estimates that 30-40 percent of total production can be lost before it reaches the market, due to problems ranging from improper use of inputs to lack of proper post-harvest storage, processing or transportation facilities (FAO, 2019)

Better availability of vegetables can be achieved by addressing food loss, through in appropriate post-harvest practices.

Post-harvest refers to time farm produce leaves the field, after maturity, to the time of culinary preparation for consumption. Usually harvesting operation is considered part of the post-harvest period because the decisions taken at harvesting have impact on successive operations. Post-harvest system encompasses the delivery of the produce from the time and place of harvest to the time and place of consumption (CGAIR,2020).

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In their continuous endeavor to improve quantity and quality of the agricultural production (farmers, scientific research institutions, international organizations, agricultural production companies), a number of post-harvest practices have been prepared and developed. In part, shelf life and postharvest quality status of most harvested vegetables will depend on some postharvest practices (Bekele, 2021).The intended benefit of post-harvest practices depends on the extent to which farmers use these practices, therefore, agricultural extension seeks to identify the practices that farmers use.

Many studies regarding vegetables post-harvest practices have been done in different regions of the world(Mary et al., 2019; Injila et al., 2020; Mathala et al., 2021; Mkojera and Chove, 2021; Iorliam and Ugoo, 2022; Iveren and Tavershima, 2022; Louis et al., 2022; Negasa, 2022; Rahman and Khatun, 2022).

Study of post- harvest practices used by vegetable farmers can provide crucial information that help in in improving and maintaining the quality of vegetable. However, there are very few studies that dealt with this in Iraq in general and in the research area in particular . Therefore, there is a need to know about post- harvest practices used by vegetable farmers. The study was undertaken with the following objective: investigating the post- harvest practices used by summer vegetable farmers.

MATERIALS AND METHODS

The study was carried out in AL-Qassim District in Babylon Province, located in south central Iraq, between 32.7° and 33.8° N and 43.42° and 45.50° E. Babylon Province is located in the Middle of Euphrates provinces, a fourth vegetable producing province (CSO, 2021). Commonly cultivated crops in the district are okra (Abelmoschus esculentus L.), cucumber (Cucumis sativa L.), eggplant (Solanum melongena L.), cowpea (Vigna unguiculata L. Walp), pepper (genus Capsicum) and tomato (Solanum lycopersicum). There is no farmer specialized in the cultivation of a particular crop, but each farmer cultivate more than one crop during summer.

The population for this study consisted of 515 vegetable growers in the district. Of these 15 were chosen for testing the questionnaire's reliability, and from the 500 remaining, 250 were randomly selected to respond to the questionnaire from 1-20 June 2023.

The instrument used was a two-part questionnaire comprising socio-economic characteristics and post-harvest practices. The socio-economic characteristics included age, education level, years of experience in vegetable cultivation, number of cultivated crops, area cultivated with vegetables, and annual income from summer vegetable. The post-harvest practices used by summer vegetable farmers included seven aspects : harvest(harvest time, harvest stage); Assembling place during harvest; sorting; grading; packing mode; transport mode and marketing time, each aspects include sub-aspects. Each respondent can choose more than one sub-subject in each subject.

Content validity of the questionnaire was established by a panel of experts in fields of agricultural economic and extension. A pilot study was conducted to establish reliability of the instrument. Cronbach's alpha (a reliability coefficient of 0.91) was established, indicating the instrument used was reliable and valid.

Data were analyzed using frequency, percentage, mean (M), standard deviation

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(SD), using SPSS ver. 22, (SPSS Inc., Chicago, IL).

Results and Discussion

Vegetable farmers characteristics

Selected characteristics of the respondents have been presented in Table 1, which indicates that majority (55.2%) of them were young with (25-50) years old. Young farmers tend to optimization labor input to agricultural production and improving land use rate, resulting in sufficient agricultural labor and land input, which has a positive impact on agricultural output (Tomas et al., 2020; Liu et al., 2021; Abdulrazaq et al., 2023).

Education helps farmers to be more aware of their problems and fined appropriate solutions ,so, it has a strong effect in the successful application of recommended cultivation practices, thereby paves the way for achieving better yields(Ninh, 2021; Usman et al., 2021). Education level of vegetable farmers was varied, 38% of them within secondary level and 35.2% within university educated.

Farming experience is a survival skill that expands workers' human capital accumulation, and has a solidifying effect on their cognitive thinking and behavioral performance, so, when farmers gain experience over time, they acquire more information on the benefits and risks associated with the recommended cultivation practices (Zhou and Li, 2022). Regarding years of experience in vegetable cultivation ,46.8 of the respondents showed more than 20 years followed by 37.2% within (10-20) years.

The result revealed that majority of respondents(54%) cultivate 3 crops in the summer followed by 34.8% within 2 crops. Majority of respondents (51.2%) cultivate more than 10 donum (1 donum= 2500 m^2) within summer vegetable crops, followed by 33.6% cultivate (5-10) donum. Regarding annual income from summer vegetables, majority of respondents (64%) have more than (3500 thousand) dinar followed by 25.2% within (1500- 3500 thousand) dinar.

Table 1: Characteristics of respondents

Variable	Categories	F	%
Age	< 25	54	21.6
M= 41.3 SD= 7.2	25 – 50	138	55.2
	> 50	58	23.2
Education	<Secondary	67	26.8
	Secondary	95	38.0
	University	88	35.2
Years of experience	< 10	40	16.0
M= 18.9 SD= 3.4	10 – 20	93	37.2
	> 20	117	46.8
number of cultivated crops	2	87	34.8
M= 2.8 SD=0.87	3	135	54.0
	4	28	11.2
Area cultivated with vegetable	< 5	38	15.2

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(donum)	5 – 10	84	33.6
M= 4.7, SD= 1.9	> 10	128	51.2
Annual income from vegetable	< 1500	27	10.8
(thousand dinar)	1500 – 3500	63	25.2
M= 2954 SD= 354	> 3500	160	64.0

Post-harvest practices used by vegetable farmers

Harvest

Harvest is the process of gathering the mature useful parts of vegetable crops from the field. Vegetables harvesting in study area done manually. In harvesting there are two main points that affect the quality of the crop, namely: harvest time and harvest stage.

Harvesting time is the earlier stage in postharvest handling practices (Etefa et al., 2022). Harvesting time affected vegetable crops quality (Desta et al., 2021; Hazrati et al., 2022; Thokar et al., 2022; Zhang et al., 2023) . The result about harvesting time of vegetables illustrated in Table 2 showed that majority of vegetable farmers (55.2%) harvested their crops at morning followed by 46.0% at afternoon and 13.6% at any time.

harvesting activities should be completed during the coolest time of the day (Rajapaksha et al., 2021)

Vegetables are harvested at various stages. Harvesting vegetables at the right stage of maturity results in high quality, nutritious products(Kharel , 2022). The stage at which vegetables should be harvested plays an important role in controlling many post-harvest activities, including the market life, storage, transport, eating and pro cessing quality(UNECE, 2019; Valenzuela, 2023). When vegetables did not harvested at the properat maturity stage , physiological processes occur that changing their taste, appearance and quality (Quamruzzaman et al., 2022).

Regarding harvest stage, most of respondents (87.2%) harvest their crops at full ripe stage, while (45.2%) harvest at half ripe stage. All cultivated summer vegetables harvest at full ripe except tomato which harvest at half ripe stage.

Assembling place during harvest

During the harvesting process, the fruits of vegetables are assembling in specific places inside the field before they are transported to the house (to prepare them for marketing) or directly to the market. The fruits may continue to be placed in these assembling places for several hours on hot summer days.

vegetables produce should be kept shaded in the field(Zoran et al., 2020; FAO, 2023). Result presented in table 2 indicated that 22.8% of respondents assembled their crops under trees to protect them from the heat of the summer sun, this indicates the lack of trees planted in the vegetable fields.Some of vegetable growers (37.6%) assemble their crops in a small shade (structure) they build from tree trunks and palm fronds, while the most (58.4%) leave their crops out in the sun.

Sorting

Sorting is the removal of diseased, rotten or damaged vegetables from healthy ones which are unsuitable for marketing, and can be reduces the production of ethylene in

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enormous amounts and can preserve the shelf life of the commodities (Rachana et al., 2023; Zhou et al., 2023). It is very important process in vegetables packing and marketing(Ariwaodo, 2022; Pokhrel, 2020). Result in table 2 showed that 71.2% of vegetable farmers in the study area carry out the sorting process.

Grading

Grading is the process of categorizing vegetables based on their size, shape, color, stage of maturity, degree of ripening, internal characteristics, and volume to fetch high price in market (Rajapaksha et al., 2021). Some vegetables are graded according to their size into three grades as small medium and large such as okra, cucumber eggplant etc., while other vegetables like tomato are graded on the basis of color (Sravan and Tejaswini, 2020; Umani and Markson, 2020). Less than a quarter (23.2%) of vegetable farmers in the study area grading their crops.

Packing mode

Packaging is one of the important considerations in vegetable marketing aimed to protect the products from damage and external influences, reduce post-harvest losses and to make attractive to consumers(Michaliszyn et al., 2022).

According to their physiological , anatomical, and physical nature and susceptibility to microbial decay, vegetables crops need to different types of packages.(Asgar, 2020; Vigil et al., 2020; Xu et al., 2023).Giuggioli et al., 2018;

Regarding packing mode, result presented in table 2 indicated that majority of vegetable farmers (88.4%) pack their crops in plastic bags, followed by plastic crates (50.8%) , and the less (22.8%) are used net/ mesh bags.

Transport mode

In Iraq, vegetable marketing centers are located far away from vegetable farms, therefore, vegetable farmers are forced to use transportation means to deliver their products to those markets. The transport of vegetable products from the fields to the markets is done by various mode (Wudad et al., 2021). The mode of transport can affect the quality of vegetable products (Mai et al., 2021; Mai et al., 2022; Wanasinghe and Sachitra, 2022).

The mode of transport that the respondents used to transport their vegetable crops to the markets are presented in Table 2. Most of vegetable farmers(66.0%) use an open vehicle as a mode of transport , which means that the crops are exposed to the heat of the sun and the high winds resulting from the speed of the vehicle during the transportation process. Closed vehicle, which can prevent vegetable crops from temperature and wind, used by 33.7% of respondents, while 33.2% of them used any mode of vehicle.

Marketing time

Agricultural marketing covers all the activities in the movement of agricultural products from the farms to the consumers (Soni, 2019). Some of these activities affect the quality of the vegetable commodities and the marketing losses, such as marketing time. The marketing time for vegetable crops depends on several factors , including harvest time, distance to marketing centers and marketing mode. Result in Table 2 indicate that half of respondents marketing their crops at morning, 68.8% at afternoon , while only 21.2% of vegetable

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farmers in the study area marketing their crops at any time. Farmers whom marketing at morning, harvest their crops at afternoon in the day before, or, they harvest their little crops during the very early hours of the morning of the same day. As for those who market their crops in the afternoon, they are the ones who start harvesting in the morning and complete the process at or before noon.

Table2: post-harvest practices used by summer vegetable farmers

practices			F*	%
Harvest	Harvest time	Morning	138	55.2
		Afternoon	115	46.0
		Any time	34	13.6
	Harvest stage	Half ripe	113	45.2
		Full ripe	218	87.2
Assembling place during harvest		Under trees	57	22.8
		Inside structure	94	37.6
		In the open	146	58.4
Sorting			178	71.2
Grading			58	23.2
Packing mode		Plastic bags	221	88.4
		Net /Mesh bags	57	22.8
		Plastic crates	127	50.8
Transport mode		Open vehicle	165	66.0
		Closed vehicle	94	37.6
		Any one	83	33.2
Marketing time		Morning	125	50.0
		Afternoon	172	68.8
		Any time	53	21.2

* multiple choices(Each respondent can choose more than one sub-subject in each subject)

Conclusion and recommendation

Majority of summer vegetable farmers were young, highly years of experience in vegetable cultivation, cultivate more than 10 donum within 3 crops and get a good annual income from summer vegetables. Most of respondents harvest their crops at full ripe stage, leave their crops out in the sun, carry out the sorting process, don't grading their crops, pack their crops in plastic bags, use an open vehicle as a mode of transport, and marketing their crop at morning. An effective agricultural extension strategy is needed to diffusion modern and effective post-harvest practices.

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