



## Measuring the Capacity of the Ṣā'

### Introduction

There are a number of weights and capacities which have been specifically mentioned in the body of hadith; some are related to acts of worship and so make it necessary to act upon the exact amount. There are a number of papers written on this topic (Muhammad, 2001) (al-Kurdi, 2005); however our study will be more focused. The one of particular interest in this discussion is the Ṣā' which is used to calculate the ṣadaqa al-fitr, the fidya for not keeping fasts and also as kaffāra (expiation) of sins. (Hasan Hallāq, 2007)

There are three types of means to determine quantities recorded from the days of the Prophet may Allah send salutations and peace upon him; *wazn* (pl. *al-Awzān*) weight, *qiyās* (pl. *al-Aqyisa*) measure and *kayl* (pl. *al-Akyāl*) capacity. Our focus is going to be on the latter which is *kayl* (capacity) in determining the quantity of a ṣā'; we will however touch on a number of *al-Akyāl* and *al-Awzān* when determining it as some are its components.

There are a number of traditions which mention as to what weight and capacity should be based on; I will quote one to make the point:

المكيالُ مكيالُ أهلِ المدينةِ ، والوزنُ وزنُ أهلِ مكّة

“Determining capacities is based on the capacities of the People of Madina and determining weights is based on the weights of the People of Makka.”<sup>1</sup>

This is because the dirham and dinar were weighed which was based on the main occupation of the Muslims in Makka, in other words trade; and as foodstuff commodities had their capacities determined which was based on the main occupation of the Muslims in Madina, in other words farming. Therefore, *niṣab* for Zakah is calculated based on the Makkan measure and those issues associated with the ṣā' is calculated based on the Medinan measure.

I will attempt to separate the weights and the capacities but there will be some necessary comparative discussion due to the fact that certain weights also equate to capacities; this will be of interest as weights and volumes cannot be identical of various commodities due to their different densities.

It must also be said from the outset that there is disagreement amongst the fuqaha on many of the measures, therefore I will not discuss all the views on every issue. Having said that, on key measures the four schools will be mentioned. I am also not going to source the evidence for the positions of the schools as that is beyond the scope of this paper.

الراوي: عبدالله بن عمر المحدث: البيهقي - المصدر: السنن الكبرى للبيهقي - الصفحة أو الرقم: ٣١/٦  
خلاصة حكم المحدث: هو الصواب الراوي: عبدالله بن عمر المحدث: البيهقي - المصدر: السنن الكبرى للبيهقي - الصفحة أو الرقم: ٣١/٦  
خلاصة حكم المحدث: هو الصواب



## Fundamental Considerations

### Al-Awzān - The Weights used in the Era of the Prophet ﷺ

#### The Dirham

It is reported by Abū 'Ubayd al-Qāsim ibn Salām from a number of his teachers that the dirham was of two types in the era of the Prophet ﷺ:

al-Sawdā' al-Wāfiyya which weighed eight dawāniq and,

al-Ṭabriyya al-Itq which weighed four dawāniq. So when 'Abdulmalik ibn Marwān, reported to be the first person to have minted the dirham, was making the dirham he feared if he made it according to the al-Wāfiyy then he would be depreciating the amount of Zakah and if he based it on the al-ṭabriyya then he could be taking the wealth of the people unlawfully so he took the average of the two and considered it as six dawāniq.<sup>2</sup>

However this position is challenged and not accepted as the correct view; rather the correct view is that the value of six dawāniq was the only value in the era of the Prophet ﷺ and it was used after that era; it is based on a number of hadith and the one quoted in the Introduction. It also goes against the sound understanding that the Prophet ﷺ would fix Zakah on a well-known determined value rather than the subjective one as outlined above. This is the correct view.

Abu'l-'Abbās ibn Surayj states that this is equivalent in grain to fifty grains and two-fifths of a grain. Abū Muḥammad ibn Aṭiyya explains the grain in detail. He says it is a rough barley grain of average size which is not peeled by its ends being cut and taken out of its outer bran layer and hull (al-Maqrīzī, 2007); the one that is peeled is referred to as pearl barley.

There are two views amongst the fuqahā on the weight of the dirham based on rough barley.

The Aḥnāf view is that the dirham is seventy average barley grains.<sup>3</sup>

The other three madhāhib are of the view quoted above fifty and two-fifths average barley grains.<sup>4</sup>

For completion sake a dinar, also a sharī mithqāl, is one hundred grains according to aḥnaf and according to the others it is seventy-two grains; so it is around 43% more in both cases as both parties agree that every ten dirham is seven mithqāl, in other words seven dinar.

The question which comes up is why the difference between the aḥnāf and the others are the two weights the same? In other words, are the Hijazi grain heavier either due to size or weight? Or is the weight different which means every measure will now be different due to this fundamental difference.

We turn to these questions next.

The Agriculture and Horticulture Development Board in 2005, then known as HGCA, supported research in conjunction with the Scottish Executive Environment and Rural Affairs Department to assess barley growth in the UK. For our interest, it was found that the average grain weight did not vary when comparing what was grown in the North with the South. (HGCA, 2006, p. 24)

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<sup>3</sup> Tabyīn al-Ḥaqā'iq (1/278), Fatḥ al-Qadīr (2/213), al-Baḥr al-Rā'iq (2/396)

<sup>4</sup> Al-Ikyāl (p. 89), Muḡnī al-Muḡtāj (1/389), al-Rawḍ al-Murabbi' (1/380), Muwāhib al-Jalīl (3/137), al-Īḍāḥ (p. 55), al-Inṣāf (7/9), Kashāf al-Qinā' (2/262)



Furthermore, research carried out in the Czech Republic from six barley cultivators across the country in which six varieties of barley were measured in a number of ways found remarkable consistency in the grain. (Sykorova, et al., 2009)

This demonstrates that even due to significant climate differences there seems to be no marked difference in the weight of the barley grain. This would be even more irrelevant due to the similarity in climates in Madina and Baghdad. Therefore, we conclude that this is based on separate knowledge which reached the fuqahaā in Iraq and as a result they used a higher weight

We now have reached the first principle to calculating the ṣā‘ after we have the weight of a dirham.

In order to calculate a ṣā‘ we have to first calculate a mudd, as four mudd make a ṣā‘, but for that we need to work out how many raṭl make a mudd and finally how many dirhams make a raṭl. All the above are based upon one another. The only independent measure is the number of barley grains which is used to determine the dirham. This is expected to be relatively uniform over time and place if it is not treated differently by the farmers.

### **The Raṭl**

There are a number of views with respect to the raṭl. (al-Sindī, 2014)

The view of Imam Nawawī which is the view of the Shafīyya and the Ḥanābila, is that it is one hundred and twenty-eight and 4/7 dirham. Others have removed the fraction and consider it as one hundred and twenty-eight dirhams – this is also the Mālikī view.

The raṭl is one hundred and thirty sharī dirhams according to the Hanafi view. On this point Mullā Khusrū mentions in Gharar al-Aḥkām, “It is compulsory on every Muslim to give half a ṣā‘ of wheat grain, or its flour or its gruel – from a ṣā‘ - which is one thousand and forty dirhams; for that is the regarded ṣā‘.

As we will soon see there are eight raṭl in a ṣā‘ so therefore 8 raṭl x 130 dirham = 1040 dirhams.

Let us turn to that next. But before we do it is interesting that the three are being compared as though they are equal in weight, I mean the grain, flour and the subsequent gruel. That would mean that they would fill the same volume which can be possible if the flours are the lower density as they will pack better and hence be required to be more in volume in order to be the same weight. We will investigate this later.



Table 1 – Densities of Commodities

Commodity	Density (g/cm <sup>3</sup> )
Wheat Grain	0.785
Wheat Flour	0.481
Barley Grain	0.641
Barley Flour	0.400

Data from Anval. (Anval, n.d.)

### The Mudd

There are two views with respect to the mudd.

The aḥnāf view which is that it is two raṭl; which equates to two hundred and sixty dirham.

The view of the others which is that it is one raṭl and 1/3; which equates to just over one hundred and seventy dirham (170.24 dirhams)

### The Ṣā‘

There is agreement of the fuqaha that four mudds make a ṣā‘.

Therefore, according to aḥnāf it is eight raṭl; which is equivalent to one thousand and forty dirhams.

The others calculate it to be five and one-third raṭls; which is equivalent to just under six hundred and eight-one dirhams, 680.94 dirhams to be precise.

### Research of the Elders

I will list below the research of the elders and what was utilised to reach that decision. I have mentioned a few to demonstrate the variability and how in most cases the value of the dirham was not determined but based on calculation.



Table 2 – Literature Review

Researcher	Research Method	Şā'	Reference
Sh. Zufar Ahmad Uthmani	Secondary Source Mudd of Sayyiduna Zayd	Indian weights ½ 1.633kg wheat	Imdād al-Aḥkām Vol 2, pp. 42-43
Sh. Rashid Ahmad Ludyānwī	Secondary Source Detailed	3.4852kg Barley 4.4318kg Wheat	Aḥsan al-Fatāwā, Vol. 4, pp. 385-416
Sh. Muhammad Shafī'	Primary Source Detailed	Indian weights 3.1842kg	Jawāhir al-Fiqh, Vol. 3 pp. 387-437

The views of others have been gathered in two publications (Raḍā'alḥaqq, 2015) who discusses it primarily from the Indian subcontinent measures which are then converted into g/kg in some cases; and more recently (Shabbir, 2017) who discusses in g/kg. In this study, he finds the range of values from 1.106kg to 2.32kg.

This range could be due to many reasons, some are listed below

1. The use of the mudd vessel  
There are a number of mudd vessels as a result 'Ulamā will reach different conclusions. Also as this is a volume then the weight of each commodity will vary due to the different densities (cf. Table 1); but this will be explored.
2. The use of other units  
It has been observed that calculations were carried out in Indian units and as a result error can occur.
3. The use of converting from other units  
It has been discovered that there are a number of views for the subunits and when these are calculated then errors can creep in.
4. Lack of first-hand research  
With the exception of Jawāhir al-Fiqh in which first hand research was carried out we see little evidence for determining the Şā' from first principles.

In a number of cases we have seen the use of the mudd vessel utilised to determine the Şā' but this is problematic in a number of ways; there is no agreement on the vessel size, its accuracy cannot be verified and the soundness of the chain of narrators.

The approach that Mufti Shafī' has adopted is scientifically sound as it is the utilisation of a measure which is standard and independent. Having said that, the measuring apparatus available to him and the fact that it was measured in Indian units first and then converted to g/kg could be a potential source for error. Also, there would have been a significant range in grain size and as a result sample



to sample consistency would vary. This cannot be explored as his raw data is not available for analysis.

The scientifically sound approach would be to determine the dirham's weight using an independent standard with little variability in grams/milligrams using scientific balances. Then to subsequently calculate the mudd, raṭl and ṣā' from that value.

The author is not aware of any first-hand research carried out as discussed above. As a result, an experiment was devised and conducted in order to determine the weight of the dirham.

## Experiment and Results

A 1kg batch of Whole Grain Milling Wheat and Whole Grain Milling Barley was sourced from Brow Farm. It was selected as it meets the criteria detailed earlier in that it is of average size and not peeled. Also due to consumer demands grains are more uniform than would be available from farmers in India approximately a century ago. Recently the author has sourced barley grain from India; this will allow us to compare UK and Indian grain. If found to be different then this raises the question that would it be correct to use the conclusion from the research by Mufti Shafī?

Six samples will be taken from the two types of barley grain and then weighed to three decimal places in a closed environment so air movement is eliminated from any measure. The wheat grain will be measured just for comparison. The average is then taken from the six samples to determine the weight of the dirham. Whilst doing the experiment I will also determine the dinar as both are used to determine the nisab for Zakah.

The mudd, raṭl and ṣā' is then calculated.

Another area I wish to explore is comparing the flour to the grain. It is understood that one can give a ṣā' of either the grain or the flour; however, if the weight is equal as determined by the dirham would we expect the capacities to be the same? In other words, does the density compensate and result in both having the same volume?

**Table 3- Determining the Dirham using UK Barley Grains**

Sample Identifier	Weight
A	3.673g
B	3.735g
C	3.942g
D	3.797g
E	3.585g
F	3.815g
<b>AVERAGE</b>	<b>3.76g</b>



Table 4 - Determining the Dinar using UK Barley Grains

Sample Identifier	Weight
A	5.381g
B	5.303g
C	5.409g
D	5.388g
E	5.206g
F	5.524g
AVERAGE	5.37g

Table 5- Determining the Dirham using Indian Barley Grains

Sample Identifier	Weight
A	2.159
B	2.399
C	2.245
D	2.214
E	2.131
F	2.166
AVERAGE	2.22g

Table 6 - Determining the Dinar using Indian Barley Grains

Sample Identifier	Weight
A	3.196
B	3.418
C	3.142
D	3.123
E	3.091
F	3.177
AVERAGE	3.19g



Table 5 - Comparison of UK Wheat Grain and Flour

Sample Identifier	Weight	Volume
Grain A	26.04g	37.0cm <sup>3</sup>
Grain B	26.70g	36.5cm <sup>3</sup>
Grain C	25.84g	36.0cm <sup>3</sup>
<b>AVERAGE GRAIN</b>	<b>26.2g</b>	<b>36.5cm<sup>3</sup></b>
Flour I	24.60g	44.0cm <sup>3</sup>
Flour II	20.95g	32.5cm <sup>3</sup>
Flour III	24.63g	43.0cm <sup>3</sup>
<b>AVERAGE FLOUR</b>	<b>23.4g</b>	<b>39.8cm<sup>3</sup></b>

Density of wheat grain =  $26.2/36.5 = 0.72\text{g}/\text{cm}^3$

Density of wheat flour =  $23.4/39.8 = 0.59\text{g}/\text{cm}^3$

This means if we use the  $\text{ṣā}'$  as a capacity then it cannot be the same weight as the grain. In other words, it is not possible to keep both weight and capacity the same for the grain and the flour. If we go by weight then more flour is required when measured by capacity and if we go by capacity then the grain weight will be more. Therefore we will focus our efforts on the weight after determining the weight of the dirham.



Figure 1 (lhs) – Six samples of barley seeds; seventy on right hand side for dirham, with an additional thirty for dinar.

Figure 2 (rhs) – Weighing procedure for each sample



Figure 3 (lhs) – Measuring volume and weight of wheat grain

Figure 4 (rhs) – Measuring volume and weight of wheat flour



### Calculations for ṣāʿ

130 dirhams = 1 raṭl

2 raṭls = 1 mudd = 260 dirhams

4 mudds = 1 ṣāʿ = 1040 dirhams

Based on UK Grain

1040 dirhams x 3.76g = 3910.4g = 3.910kg = 1 ṣāʿ

520 dirhams x 3.76g = 1955.2g = 1.955kg = ½ ṣāʿ

Based on Indian Grain

1040 dirhams x 2.22g = 2308.8g = 2.309kg = 1 ṣāʿ

520 dirhams x 2.22g = 1154.4g = 1.154kg = ½ ṣāʿ

### Calculations for nisab

Indian Prices

200 dirhams x 2.22g = 444g of silver

Based on today's price of £0.43/g silver (25<sup>th</sup> May 2017) = £190.32

20 dinars x 3.19g = 63.8g of gold

Based on today's price of £31.17/g gold (25<sup>th</sup> May 2017) = £1276

UK Prices

200 dirhams x 3.76g = 752g of silver

Based on today's price of £0.43/g silver (25<sup>th</sup> May 2017) = £323.36

20 dinars x 5.37g = 107.4g of gold

Based on today's price of £31.17/g gold (25<sup>th</sup> May 2017) = £3347.66



## Discussions & Conclusions

It was decided that a measure independent or not based on the components which made a ṣā' had to be used to determine the base unit from which other capacities could be calculated.

It was found from the literature review that values were determined from secondary sources in the main except in a rare exception. In that case as the equipment available would not be as accurate as found in laboratories now and as the raw data is not available it was decided to conduct an experiment to determine the value of the dirham and dinar and also to see if both capacity and weight could be used or only one.

Based on the above the dirham was determined using barley grain. It was found that a dirham varied from 2.22g to 3.76g and a dinar varied from 3.19g to 5.37g. The dinar is 43% heavier as theory suggests. Furthermore, it was found that we had to select either a capacity or weight due to the differences of densities between the grain and flour. As the weight was independently determined it was selected as the measure.

The half ṣā' was averaged to be 1.55kg and the full ṣā' was 3.11kg.

As for the nisab it was as follows; silver, 598g and gold, 85.6g.

The prices based on these values is as below

200 dirhams x 2.99g = 598g of silver

Based on today's price of £0.39/g silver (5<sup>th</sup> May April 2018) = £233.22

20 dinars x 4.28g = 85.6g of gold

Based on today's price of £31.25/g gold (5<sup>th</sup> May 2018) = £2675

Ṣadaqat al-Fitr and Fidya will be as follows based on national supermarket prices in order to give a single value for the UK and to take into consideration accessibility; also the prices will rarely fluctuate. If local 'Ulamā have calculated based on local stores then one can act upon them locally; this is particularly for those who may not have access to that information.

	<b>Ḥanafī</b>	<b>Shāfi'ī/Mālikī/Hanbalī</b>
Wheat Grain (1.55kg)	- £2.19	£3.16 (based on 1 ṣā' (3.11kg))
Barley Grain (3.11kg)	- £3.42	£2.46
Raisins (3.11kg)	- £10.44	£7.52
Dates (3.11kg)	- £16.58	£11.94

In terms of a recommendation, not compulsory, one should look at one's earning when selecting the commodity for basing one's ṣadaqat al-fitr, the more one gives the better;

0 to £25,000 – Wheat Grain

£25,000 to £35,000 – Barley Grain

£35,000 to £45,000 – Raisins

Excess of £45,000 - Dates



## Bibliography

- al-Kurdi, M. N. a.-D., 2005. *al-Maqādīr al-Sharʿiyya wa'l-Aḥkām al-Fiqhiyya al-Mutaʿallaqa bihā kayl, wazn, miqyās*. 2nd ed. Cairo: s.n.
- al-Maqrīzī, A. i. A., 2007. *Kitāb al-Awzān wa'l Akyāl al-Sahrʿiyya*. 1st ed. Beirut: Dār al-Bashā'ir al-Islāmiyya.
- al-Sindī, M. Q., 2014. *al-Fayḍ al-Mubīn fī Tahṛīr al-Ṣāʿ ʿinda al-Mujtahidīn liMikyāl al-Balad al-Amīn*. 1st ed. Beirut: Dār al-Bashā'ir al-Islāmiyya.
- Anval, n.d. *Bulk Density Chart*, s.l.: Anval Valves PVT Ltd.
- Hasan Hallāq, M., 2007. *al-Īḍāḥāt al-ʿAṣriyya li'l-Maqāyīs wa'l-Makayīl wa'l-Awzān wa'l-Nuqūd al-Sharʿiyya*. 1st ed. Sana: Maktaba al-Jīl al-Jadīd.
- HGCA, 2006. *The Barley Growth Guide*, London: Scottish Executive.
- Muhammad, A. J., 2001. *al-Makāyīl wa'l-Mawazīn al-Sharʿiyya*. 1st ed. Cairo: al-Quds.
- Raḍāʿalḥaqq, 2015. *Fatāwā Dār al-ʿUlūm Zakariyyā Vol. 3*. 1st ed. Larachi: Zamzam Publishers.
- Shabbir, Y., 2017. *Ṣadaqah al-Fiṭr Calculation for Blackburn*, Blackburn: al-Nawadir.
- Sykorova, A. et al., 2009. Size Distribution of Barley Kernesl. *Czech Journal of Food Science*, 27(4), pp. 249-258.